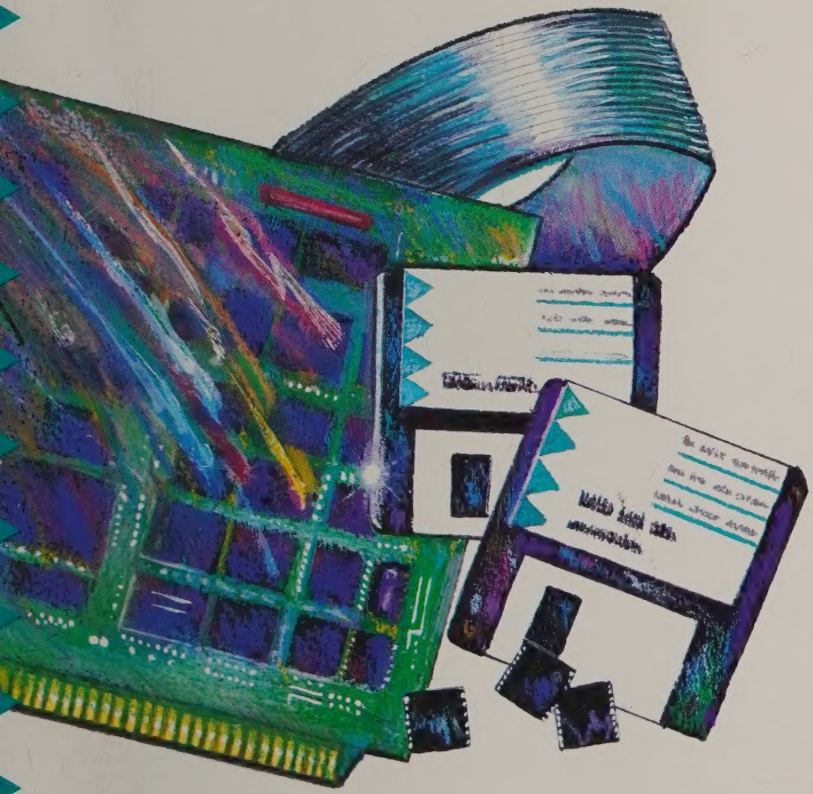
User's Guide



Adaptec SCSI Manager Set

for NetWare, OS/2, Windows NT, and UNIX

adaptec

Adaptec SCSI Manager Set

for NetWare, OS/2, Windows NT and UNIX
Version 2.0

User's Guide

adaptec®

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- File Transfer Protocol (FTP) server at ftp.adaptec.com.
- CompuServe Adaptec Forum at GO ADAPTEC.
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▼▼▼▼ Preface

Inside This Manual

This manual explains how to use Adaptec host adapter driver software with Novell NetWare® 286/386; IBM and Microsoft OS/2®; Microsoft Windows NT; and SCO® UNIX® and SCO Open Desktop.

Adaptec's drivers are embedded in the most recent versions of these operating environments. For earlier versions of the operating environments, you will need to install the Adaptec drivers from disk.

Section 1 Novell NetWare 286/386

explains how to use the Adaptec drivers embedded in NetWare 386 v4.0 and how to install and use the Adaptec drivers for earlier versions of NetWare 286/386. You probably received Adaptec drivers for the earlier versions of NetWare on the ASW-1400 diskette, included with your host adapter. (The ASW-1400 also includes drivers for other operating environments.) Or you may have purchased a separate ASW-1440 diskette, which includes only NetWare drivers.

Section 2 OS/2

explains how to use the Adaptec drivers embedded in IBM OS/2 v2.x and how to install and use the Adaptec drivers for IBM and Microsoft OS/2 v1.3. You probably received Adaptec drivers for OS/2 v1.3 on an ASW-1400 diskette included with your host adapter. (The ASW-1400 also has drivers for other operating environments.) Or you may have purchased the ASW-1420 diskette, which includes only OS/2 drivers.

Section 3 Microsoft Windows NT

explains how to use the Adaptec drivers embedded in Microsoft Windows NT.

Section 4 SCO UNIX and SCO Open Desktop explains how to use the Adaptec drivers embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0. Also explains how to install and use the *ASW-1450 SCSI Manager for SCO UNIX and Open Desktop* for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0.

Conventions

The following typographic conventions are used in this manual.

bold
Used for keystrokes (... press the **Enter** key ...).

Helvetica
Used for operator entry that must be typed exactly as shown (... device=c:aspi2dos.sys ...) and for messages on the screen (... Enter Password ...).

Helvetica Italics
Used as a place holder for text you must determine and type in (... enter *nn* for number ...). Also used for program and file names that appear in body text (... the *autoexec.bat* file ...).

Italics
Used for emphasis (... is *only* supported ...) and for document reference (... refer to Chapter 1, *Introduction*...).

ALL CAPITALS
Used for acronyms, such as SCSI and CD-ROM.

Hexadecimal Numbers
Are followed by an 'h', e.g., 330h.

End Mark
The ❒ symbol marks the end of a chapter or other section.

Advisories

Advisories are quick notes that stress an important point or warn of a potential hazard to your system or your data. This manual uses two kinds of advisories:

Note: Text set off in this way presents reminders, tips or suggestions that may make it easier for you to install, configure and use Adaptec software products and your host adapter.

Caution: Failure to observe this kind of advisory could result in loss of data or damage to your system and installed devices.

WARNING: This is a visual alarm. Failure to observe this kind of advisory could result in personal injury.

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Novell NetWare 286/386

Section 1

Chapter 1 NetWare Introduction

Chapter 2 NetWare 386 v4.0 Installation

Chapter 3 NetWare 386 v3.11 Installation

Chapter 4 NetWare 286 Installation

1 NetWare Introduction

About This Chapter

Read this chapter to find out:

- A brief description of ASPI and how it works in your system
- A brief description of the NetWare files on the Adaptec ASW-1400 and ASW-1440 diskettes
- A list of the equipment you need to use the Adaptec NetWare drivers

▼▼▼▼ 1

General Product Information

This *User's Manual* provides information for installing the following Adaptec SCSI host adapters in a Novell NetWare file server:

- AHA®-1540A, AHA-1542A
- AHA-1540B, AHA-1542B
- AHA-1540C, AHA-1542C
- AHA-1640
- AHA-1740, AHA-1744
- AHA-1740A, AHA-1742A

This manual refers to the AHA-1540A, AHA-1542A, AHA-1540B, AHA-1542B, AHA-1540C and AHA-1542C as the *AHA-1540/1542* and the AHA-1740, AHA-1744, AHA-1740A and AHA-1742A as the *AHA-1740/1742/1744*.

The supported versions of NetWare are:

- NetWare 286 v2.15 (SFT or Advanced)
- NetWare 286 v2.2
- NetWare 386 v3.11
- NetWare 386 v4.0

ASPI Manager

The Advanced SCSI Programming Interface (ASPI) is a programming interface that enables multiple drivers to share the same SCSI host adapter. This makes it possible for different kinds of SCSI devices (tape drives, disk drives, CD-ROM, etc.) to share one SCSI host adapter, thereby reducing cost while freeing up internal slots in your PC.

Figure 1-1 is a sample ASPI diagram:

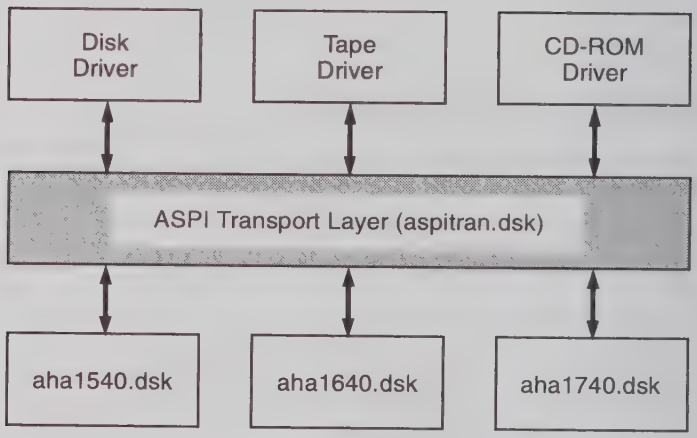

Figure 1-1. Advanced SCSI Programming Interface

Given the flexibility of ASPI, several companies are currently providing server-based tape backup solutions that use ASPI. Other ASPI modules have already been developed or are currently under development.

If you are interested in writing your own NetWare 386 ASPI module, you can obtain a programming specification from Adaptec.

Structure of Installation Diskette

As stated in the *Preface*, you probably received Adaptec drivers for NetWare 286 and NetWare 386 v3.11 on the ASW-1400 diskette included with your host adapter board. (The ASW-1400 also includes drivers for other operating environments.) Or you may have purchased a separate ASW-1440 diskette, which includes only NetWare drivers. Adaptec drivers for version 4.0 of NetWare 386 are embedded in NetWare, and therefore you do not need to load them from a separate diskette.

Figure 1-2 shows the diskette subdirectory structure of the ASW-1440 diskette.

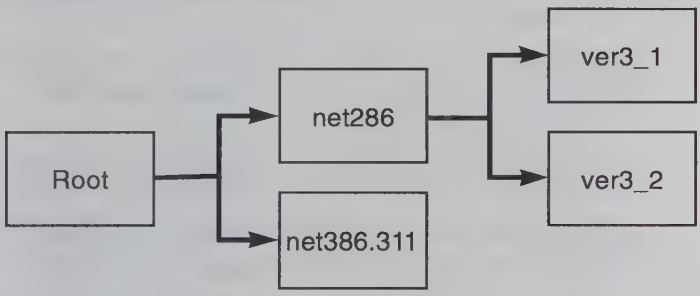

Figure 1-2. ASW-1440 Installation Diskette Subdirectories

Here are descriptions of the Adaptec files for each supported version of NetWare.

NetWare 286 v2.15

readme.txt – An ASCII text file describing the Adaptec drivers for NetWare 286 v2.15 and v2.2.

aswnovl.obj, aswnovl.dsk – Version 3.1 of Adaptec's NetWare 286 v2.15 and v2.2 drivers for the AHA-1540/1542, AHA-1640, and the Standard Mode of the AHA-1740/1742/1744. These drivers are fully Novell certified.

NetWare 286 v2.2

readme.txt – An ASCII text file describing the Adaptec drivers for NetWare 286 v2.15 and v2.2.

aswnovl.obj, aswnovl.dsk – Version 3.2 of Adaptec's NetWare 286 v2.15 and v2.2 drivers for the AHA-1540/1542, AHA-1640, and the Standard Mode of the AHA-1740/1742/1744.

NetWare 386 v3.11

readme.txt – An ASCII text file describing the Adaptec drivers for NetWare 386 v3.11.

aha1540.dsk – Version 2.34 of Adaptec's AHA-1540/1542 NetWare 386 v3.11 driver (also runs the Standard Mode of the AHA-1740/1742/1744).

aha1640.dsk – Version 2.34 of Adaptec's AHA-1640 NetWare 386 v3.11 driver.

aha1740.dsk – Version 1.22 of Adaptec's AHA-1740/1742/1744 Enhanced Mode NetWare 386 v3.11 driver.

aspitran.dsk – Version 1.0 of Adaptec's ASPI transport layer.

All of Adaptec's NetWare 386 v3.11 drivers are fully Novell certified and fully NetWare Ready certified.

NetWare 386 v4.0

These Adaptec drivers and files are embedded in NetWare 386 v4.0:

aha1540.dsk – Version 3.0 of Adaptec's AHA-1540/1542 NetWare 386 v4.0 driver (also runs the Standard Mode of the AHA-1740/1742/1744).

aha1640.dsk – Version 3.0 of Adaptec's AHA-1640 NetWare 386 v4.0 driver.

aha1740.dsk – Version 2.0 of Adaptec's AHA-1740/1742/1744 Enhanced Mode NetWare 386 v4.0 driver.

aspitran.dsk – Version 4.0 of Adaptec's ASPI transport layer.

aha1540.ddi, aha1640.ddi, aha1740.ddi – Driver Definition Information files, used by the NetWare *install* program.

All of Adaptec's NetWare 386 v4.0 drivers are fully Novell certified and fully NetWare Ready certified.

Equipment Required

- IBM PC-AT compatible system, Micro Channel® compatible system, or EISA system
- Adaptec AHA-1540/1542, AHA-1640, or AHA-1740/1742/1744 host adapter
- Adaptec ASW-1400 or ASW-1440 diskette
- Novell NetWare 286 v2.15 or v2.2; NetWare 386 v3.11 or v4.0
- One or more Local Area Network (LAN) cards
- This User's Manual

Other Documentation

- Adaptec's AHA-1540/1542, AHA-1640, or AHA-1740/1742/1744 User's Manual
- 286 or 386 Installation, SFT NetWare Manual (provided by Novell)

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2 NetWare 386 v4.0 Installation

About This Chapter

Read this chapter to find out:

- How to install Adaptec drivers for NetWare 386 v4.0
- The command line options that can be specified when the driver is loaded
- How NetWare 386 v4.0 drivers support the installation of multiple SCSI hard disk drives in the file server
- Information on booting a NetWare 386 server from SCSI, formatting media, using removable media, and accessing over 16 MBytes of RAM
- The meaning of error messages generated during initialization

▼▼▼▼ 2

Installing NetWare 386 v4.0

Drivers for Adaptec host adapters are embedded in NetWare 386 v4.0. You do not need any separate Adaptec disks to load these drivers. Typically, you will load the drivers when you install a new NetWare 386 v4.0 server that has one or more Adaptec host adapters or when you install one or more Adaptec host adapters in an existing NetWare 386 v4.0 server.

In both cases, you load the driver by selecting the host adapter model from a list in the NetWare *install* program. The NetWare *install* program will prompt you for the required parameters such as DMA, port address, etc. If necessary, you can enter other command line options later. These options are listed and explained in *Command Line Options* on page 2-7.

1 To begin the installation process, type :load install at the NetWare prompt and press **Enter**. The following screen will appear:

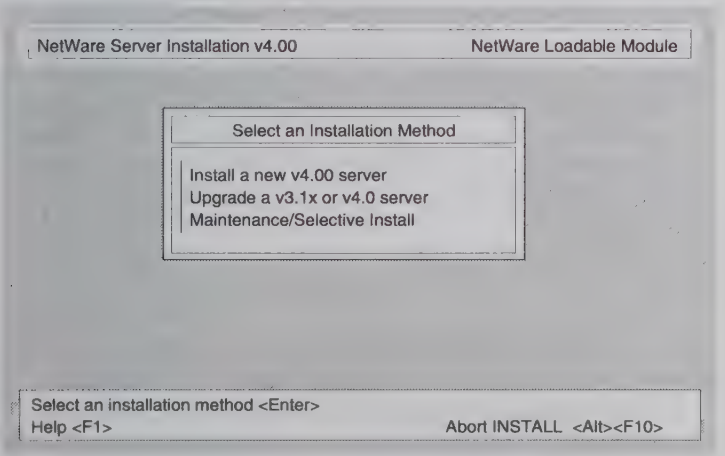


Figure 2-1. NetWare Installation Menu

2 Select **Install a new v4.00 server** if you are installing a new server with an Adaptec host adapter. Select **Maintenance/ Selective Install** if you have installed a new Adaptec host adapter in an existing NetWare server.

3 Press **Enter** when you have highlighted your selection, then follow the directions that appear on the *install* program screens. Eventually, you will see this screen:

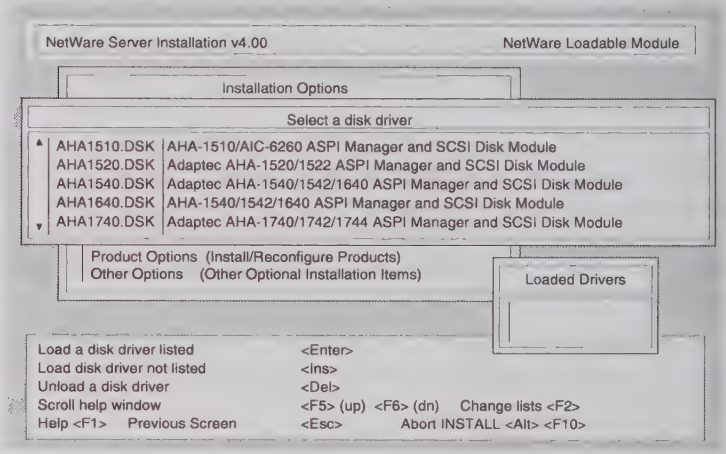

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Select a disk driver
AHA1510.DSK AHA-1510/AIC-6260 ASPI Manager and SCSI Disk Module
AHA1520.DSK Adaptec AHA-1520/1522 ASPI Manager and SCSI Disk Module
AHA1540.DSK Adaptec AHA-1540/1542/1640 ASPI Manager and SCSI Disk Module
AHA1640.DSK AHA-1540/1542/1640 ASPI Manager and SCSI Disk Module
AHA1740.DSK Adaptec AHA-1740/1742/1744 ASPI Manager and SCSI Disk Module
Product Options (Install/Reconfigure Products)
Other Options (Other Optional Installation Items)
Loaded Drivers
Load a disk driver listed <Enter>
Load disk driver not listed <Ins>
Unload a disk driver <Del>
Scroll help window <F5> (up) <F6> (dn) Change lists <F2>
Help <F1> Previous Screen <Esc> Abort INSTALL <Alt> <F10>

Figure 2-2. List of Adaptec Drivers

Help text specific to each driver will appear in a window in the middle of the screen as you scroll down the list. The **Loaded Drivers** window below the list of available drivers displays the names of drivers as you add them to the list.

4 Select the driver for the Adaptec host adapter installed in your server, then press **Enter**. The screen should look similar to:

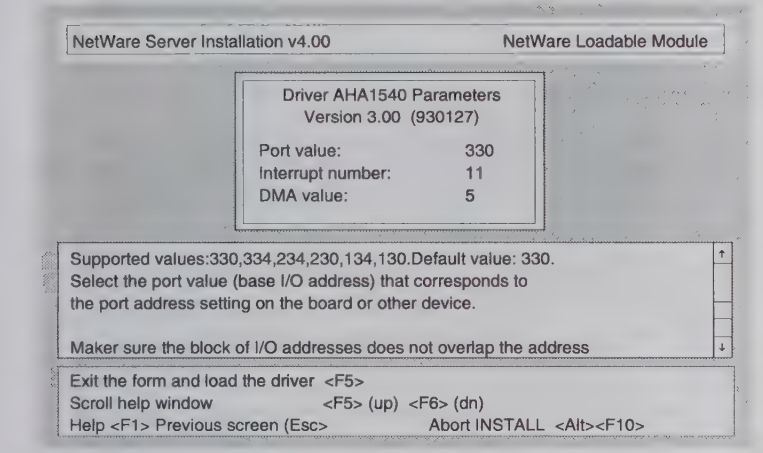

NetWare Server Installation v4.00
NetWare Loadable Module
Driver AHA1540 Parameters
Version 3.00 (930127)
Port value: 330
Interrupt number: 11
DMA value: 5
Supported values:330,334,234,230,134,130.Default value: 330.
Select the port value (base I/O address) that corresponds to
the port address setting on the board or other device.
Maker sure the block of I/O addresses does not overlap the address
Exit the form and load the driver <F5>
Scroll help window <F5> (up) <F6> (dn)
Help <F1> Previous screen (Esc> Abort INSTALL <Alt><F10>

Figure 2-3. Driver Parameters

This screen prompts you for the parameter values required by the driver. Default values are suggested. The parameters listed on the screen will vary, depending on which driver you selected. As you highlight different fields in the parameters window, Help text in the middle of the screen lists the allowable values for the parameter and other information about changing the parameter's value.

5 Leave the suggested default values or change the values, depending on the requirements of your installation. NetWare will not allow you to enter illegal values, and it will display an error message if the value you enter is not available–for example, if you try to assign a port address that is already used by another board.

NetWare will determine if loading the driver will cause any conflicts (i.e., two host adapters at DMA 5). If there is a possibility for a conflict, the driver will not be loaded.

6 When the parameters are entered correctly, press **F10** to load the driver. If you press **Esc**, NetWare will prompt you to either

load or not load the driver. Select **Yes** to load the driver; select **No** to cancel the loading of the driver.

NetWare will load the driver at this point to validate your selection.

Multiple Host Adapters

If your server has multiple host adapters, you need to load the driver for each host adapter individually. If all the host adapters are the same model, you must load the same driver again for each adapter.

> **Note:** If your system has multiple host adapters, each host adapter must have its own SCSI bus. No two host adapters may be connected to the same SCSI cable.

To load additional drivers, return to the screen shown in Figure 2-2 by pressing **Esc** after you load the first driver. Select the appropriate driver, and enter the parameter values required for it. Be sure to enter different values for parameters such as slot address and IRQ. Press **F10** after loading each driver. As you load more drivers, their names will appear in the **Loaded Drivers** window on the screen shown in Figure 2-2.

Refer to the *NetWare Installation Manual* for information on installing other NetWare Loadable Modules (NLMs). If an error message appears when you attempt to load the driver, see the error message information beginning on page 2-23.

Command Line Options

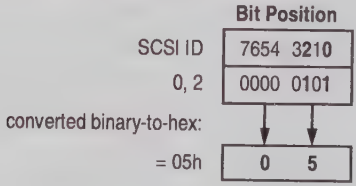
The following table lists and describes the command line options you can use to adjust the configuration of Adaptec NetWare drivers.

Option	Values	Adapter	Description
port=	330h 334h 234h 230h 134h 130h	AHA-1540/1542	This option selects the host adapter's port address, which should correspond to the jumpered port address of the AHA-1540/1542. If none is given, the user will be prompted for one. Port 330h is the default value.
speed=	00-FFh	AHA-1540/1542	This option sets the AT Bus Master transfer speed. The pre-programmed speeds are: 0 = 5.0 MBytes/sec 1 = 6.7 MBytes/sec 2 = 8.0 MBytes/sec 3 = 10.0 MBytes/sec 4 = 5.7 MBytes/sec FF=3.3 MBytes/sec This option overrides the jumper settings. Keep in mind that some computers may not be able to handle the higher transfer speeds. The default is 5.0 MBytes/sec.
bus_on=	2-15	AHA-1540/1542	This option sets the host adapter's bus-on time. The units are in microseconds. If this option is not chosen, the default value of 11 microseconds is used.
bus_off=	1-64	AHA-1540/1542	This option sets the host adapter's bus-off time. The units are in microseconds. If this option is not chosen, the default value of 4 microseconds is used.
slot=	1-8 1-15	AHA-1640 AHA-1740/1742/1744	This option selects the host adapter's slot location. If none is given, the user will be prompted for one.
verbose=	y	AHA-1540/1542 AHA-1640 AHA-1740/1742/1744	This option causes the driver to display host adapter configuration information at load time.

Option	Values	Adapter	Description
removable=	off	AHA-1540/1542 AHA-1640 AHA-1740/1742/ 1744	This option disables support for removable media. (By default, removable media is supported.) You may want to disable removable disk support in order to load your own ASPI removable disk module.
fixed_disk=	off	AHA-1540/1542 AHA-1640 AHA-1740/1742/ 1744	This option disables support for fixed disk drives. (By default, fixed disk drives are supported.) You may want to disable fixed disk support in order to load your own ASPI fixed disk module.
dev_enable=	00-FFh	AHA-1540/1542 AHA-1640 AHA-1740/1742/ 1744	This option allows you to enable the driver's registration of SCSI devices on a per target basis. This enable mask is entered in hex. (see *Bit Mask Options* below)
above16=	y	AHA-1540/1542 AHA-1640	This option allows the host adapter to access RAM above 16 MBytes. Note: The AHA-1740/1742/1744 in Enhanced Mode can directly access up to 4 GBytes, and this option is not needed and should not be used.

Bit Mask Options

Use this example to aid in calculating bit-mask option hex values. Each SCSI device (ID 0-7) is enabled by a 1 in its corresponding bit position. In this example, dev_enable=05 enables driver registration of the devices at SCSI IDs 0 and 2:



The command line options are *not* case sensitive or white-space sensitive. Placing commas between command line options is optional.

Multiple Disk Drives

Adaptec's NetWare 386 v4.0 drivers support the installation of multiple SCSI hard disk drives in the file server. There are several reasons why you might want to use multiple hard disk drives:

- To support disk mirroring (fault tolerance)
- To support disk duplexing (fault tolerance)
- To increase total storage capacity of the system
- To install multiple drives per NetWare volume

Mirroring

Disk mirroring refers to two or more hard disks which contain the same data and which are installed on a single host adapter. If one disk fails, the other disk(s) will continue to function without interruption to the end user, thus minimizing network down time. Figure 2-4 illustrates disk mirroring with NetWare 386.

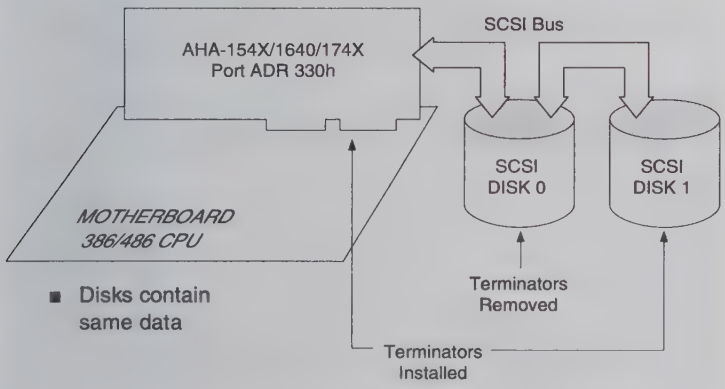


Figure 2-4. Disk Mirroring

You should take the following hardware considerations into account when you prepare disk drives for mirroring:

- The NetWare partitions should be nearly the same size. NetWare will not allow partitions that vary greatly in size to be mirrored. Refer to the *NetWare Installation Manual* for the limitations.

- The drives must be connected to the same SCSI cable on the same host adapter.
- The drives must have different SCSI IDs.
- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other SCSI devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the on-board terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

The NetWare procedure for installing a mirrored pair of disk drives is similar to the Standard installation procedure. The *install.nlm* module should be loaded from the console. This must be done after the *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk* driver has been loaded.

1 Enter load install. The screen should look similar to:

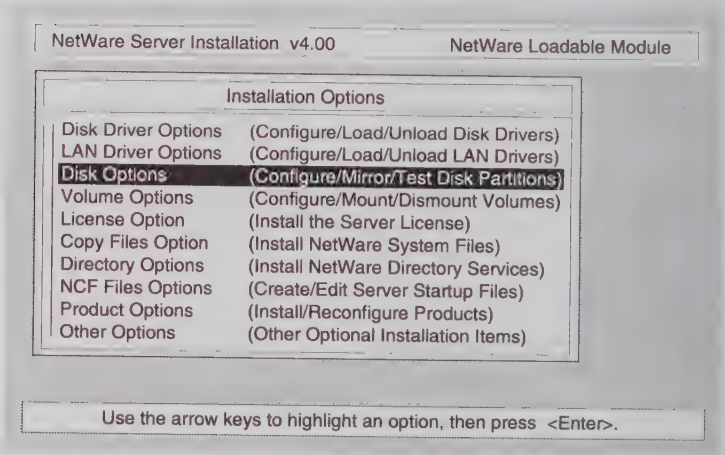

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Disk Options (Configure/Mirror/Test Disk Partitions)
Volume Options (Configure/Mount/Dismount Volumes)
License Option (Install the Server License)
Copy Files Option (Install NetWare System Files)
Directory Options (Install NetWare Directory Services)
NCF Files Options (Create/Edit Server Startup Files)
Product Options (Install/Reconfigure Products)
Other Options (Other Optional Installation Items)
Use the arrow keys to highlight an option, then press <Enter>.

Figure 2-5. NetWare Installation Options

2 Select **Disk Options**. The screen should look similar to:

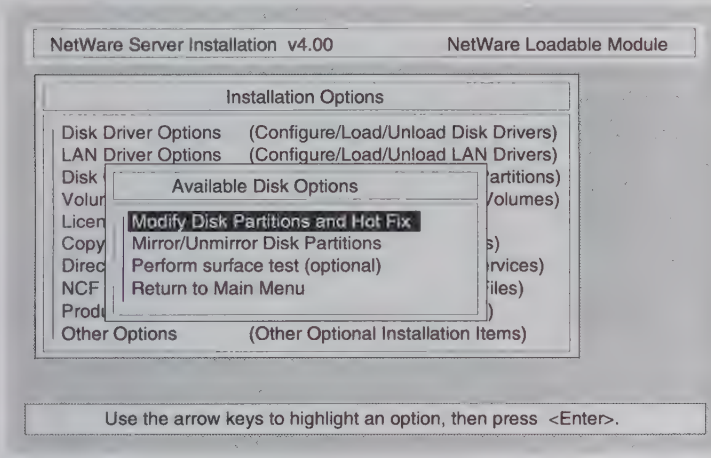

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Available Disk Options
Modify Disk Partitions and Hot Fix
Mirror/Unmirror Disk Partitions
Perform surface test (optional)
Return to Main Menu
Other Options (Other Optional Installation Items)
Use the arrow keys to highlight an option, then press <Enter>.

Figure 2-6. Available Disk Options

3 Select **Modify Disk Partitions and Hot Fix**. The screen should look similar to:

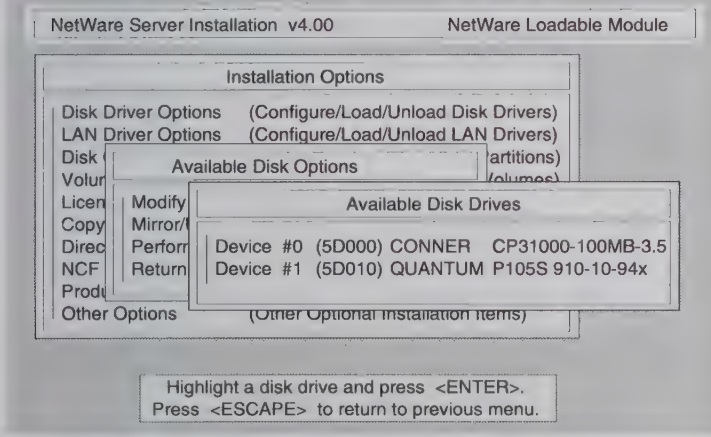

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Available Disk Options
Available Disk Drives
Device #0 (5D000) CONNER CP31000-100MB-3.5
Device #1 (5D010) QUANTUM P105S 910-10-94x
Other Options
Highlight a disk drive and press <ENTER>.
Press <ESCAPE> to return to previous menu.

Figure 2-7. Available Disk Drives

The screen should display the installed disk drives. Refer to the *NetWare 386 Installation Manual* to learn how to create partitions on each drive.

4 After each drive has a NetWare partition on it, return to the **Available Disk Options** menu and select **Mirror/Unmirror Disk Partitions**. The screen should look similar to:

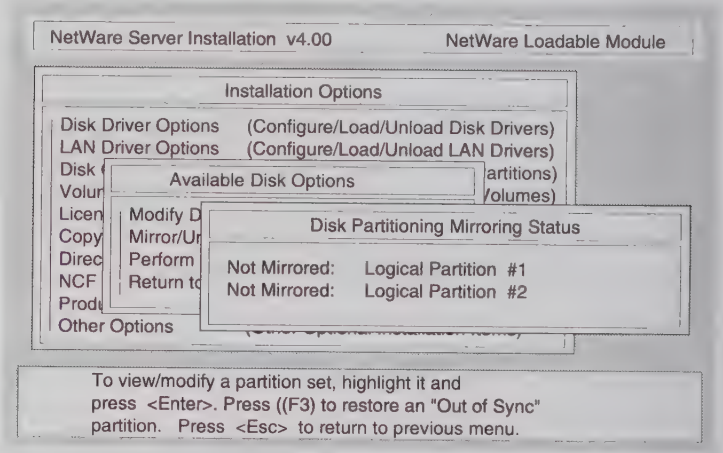

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Available Disk Options
Modify D
Mirror/Un
Perform
Return to
Disk Partitioning Mirroring Status
Not Mirrored: Logical Partition #1
Not Mirrored: Logical Partition #2
Other Options
To view/modify a partition set, highlight it and
press <Enter>. Press ((F3) to restore an "Out of Sync"
partition. Press <Esc> to return to previous menu.

Figure 2-8. Disk Partition Mirroring Status

5 Select **Not Mirrored: Logical Partition #1**, which in this case is the Quantum Pro 105S. The screen should look similar to:

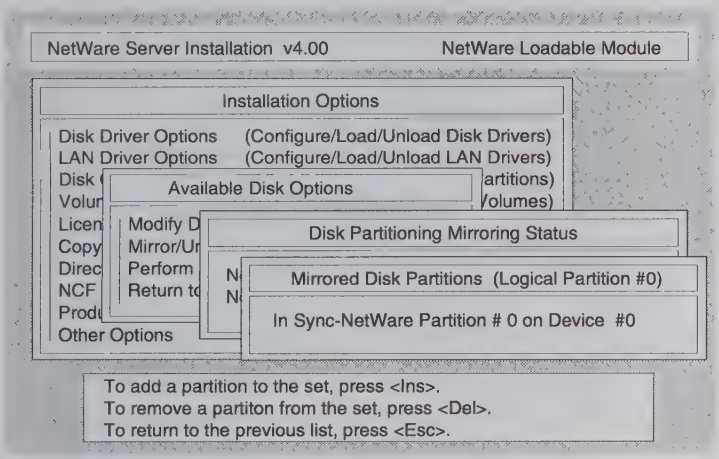

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Available Disk Options
Disk Partitioning Mirroring Status
Mirrored Disk Partitions (Logical Partition #0)
In Sync-NetWare Partition # 0 on Device #0
Other Options
To add a partition to the set, press <Ins>.
To remove a partiton from the set, press <Del>.
To return to the previous list, press <Esc>.

Figure 2-9. Mirrored Disk Partitions

6 Press **Insert.** The screen should look similar to:

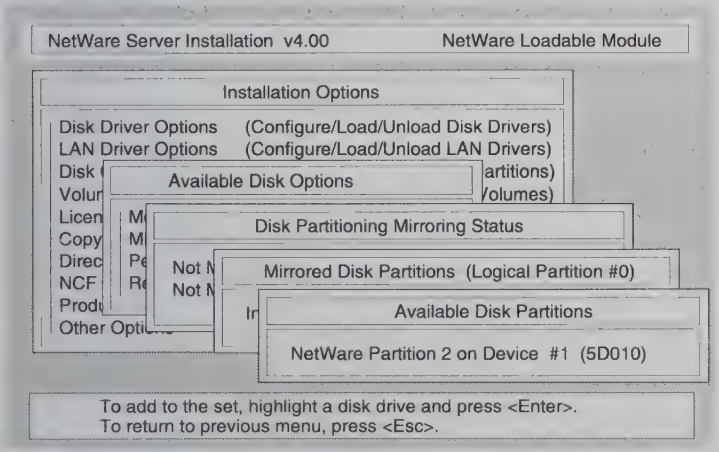

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Available Disk Options
Disk Partitioning Mirroring Status
Mirrored Disk Partitions (Logical Partition #0)
Available Disk Partitions
NetWare Partition 2 on Device #1 (5D010)
To add to the set, highlight a disk drive and press <Enter>.
To return to previous menu, press <Esc>.

Figure 2-10. Available Disk Partitions

7 Press **Enter**, then **Esc**. The screen should look similar to:

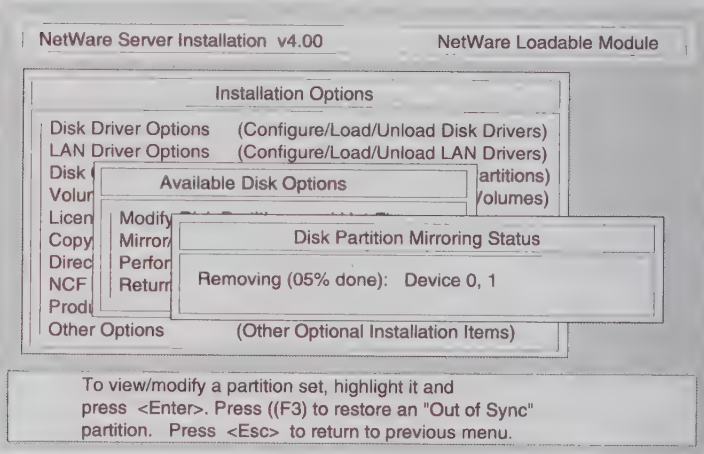

NetWare Server Installation v4.00
NetWare Loadable Module
Installation Options
Disk Driver Options (Configure/Load/Unload Disk Drivers)
LAN Driver Options (Configure/Load/Unload LAN Drivers)
Available Disk Options
Disk Partition Mirroring Status
Removing (05% done): Device 0, 1
Other Options
(Other Optional Installation Items)
To view/modify a partition set, highlight it and
press <Enter>. Press ((F3) to restore an "Out of Sync"
partition. Press <Esc> to return to previous menu.

Figure 2-11. Disk Partition Mirroring Status

The drives are now mirrored. Press **Esc** several times to exit the *install* program.

Duplexing

Disk duplexing means that two host adapters are installed in a single file server, each with its own disk mirrored together. These disk drives contain the same data. This ensures that if either one disk or one host adapter fails, the server will continue to operate. Figure 2-12 illustrates disk duplexing with NetWare 386.

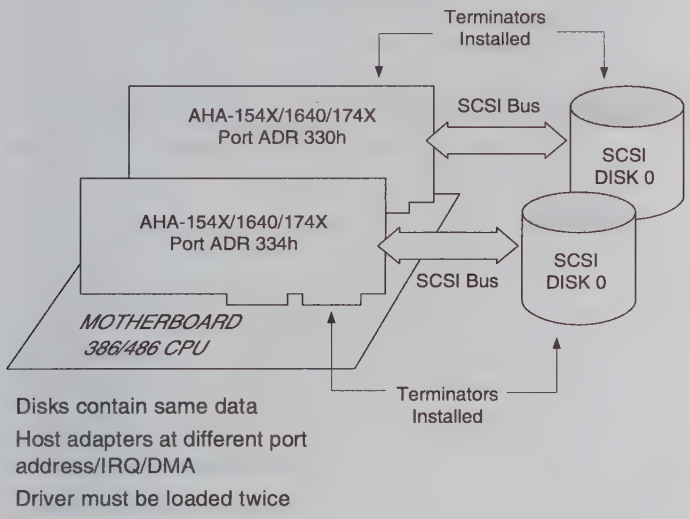


Figure 2-12. Disk Duplexing

Mirroring and duplexing are both referred to as *mirroring* in the NetWare operating system. During the installation part of NetWare, the drive mirroring status will either display Not Mirrored or Mirrored. These drives may be on the same host adapter (mirroring) or on separate host adapters (duplexing). Therefore, the procedure to mirror or duplex is exactly the same, as far as NetWare is concerned. The only difference is the hardware setup (one vs. two host adapters).

You should take the following hardware considerations into account when you prepare the disk drives for duplexing:

- The NetWare partitions should be nearly the same size. NetWare will not allow partitions that vary greatly in size to be mirrored. Refer to the *NetWare Installation Manual* for the limitations.

- Each drive must be connected to its own host adapter, and each host adapter must have its own SCSI cable.
- If both host adapters have floppy controllers (AHA-1542 or AHA-1742), one of the floppy controllers must be disabled.
- The interrupt channels (referred to as *interrupt level* with the AHA-1640) must be different on the two host adapters. See the instructions in your host adapter documentation if you need to change the interrupt channel.
- The DMA channels (referred to as *arbitration level* with the AHA-1640) must be different on the two host adapters. See the instructions in your host adapter documentation if you need to change the DMA channel.
- The host adapter BIOS must be set correctly, depending on which models of host adapters are installed and how your system is configured. (See the instructions in your host adapter documentation if you need to change the BIOS setting):
  - For AHA-1540A/1542A/1540B/1542 or AHA-1640 host adapters, the BIOS must be enabled on only *one* board.
  - For AHA-1740/1742/1744 or AHA-1540C/1542C host adapters, the BIOS may be enabled on *any or all* boards.
  - If you want the system to boot from the SCSI drive, the drive SCSI ID must be 0 and the BIOS must be enabled on the host adapter to which the drive is connected. See *Booting from a SCSI Drive* on page 2-18 for more information.
  - If you do not want to boot from the SCSI drive, you can disable the BIOS on all installed AHA-1540/1542/1640 host adapters. You do not need to disable the BIOS on installed AHA-1740/1742/1744 host adapters, even if your system does not boot from a SCSI disk drive.
- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other SCSI devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the onboard terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

The procedure for duplexing requires that the NetWare 386 driver be loaded twice. The screen should look similar to:

```
:load AHA1540 port=330 <ENTER>
Loading module AHA1540.DSK
   Adaptec AHA-1540/1542/1640 ASPI Manager & SCSI Disk Module
   Version 3.0
   Copyright 1992 Adaptec, Inc.  All rights reserved
   Auto-loading module ASPITRAN.DSK
   Adaptec NetWare 386 ASPI Transport Layer v4.0
:load AHA1540 port=334 <ENTER>
Loading module AHA1540.DSK
   Adaptec AHA-1540/1542/1640 ASPI Manager & SCSI Disk Module
   Version 3.0
   Copyright 1992 Adaptec, Inc.  All rights reserved
```

Figure 2-13. Loading NetWare Driver Twice

The NetWare procedure for installing a duplexed pair of disk drives is the same as for the mirrored installation. Follow the directions in *Mirroring* on page 2-9.

Special Considerations

This section deals with these topics:

- Booting a NetWare 386 server from a SCSI drive
- Formatting media
- Using removable media
- Accessing more than 16 MBytes of RAM
- Using Adaptec's NetWare Ready drivers and host adapters
- Performing tape backups under Novell NetWare

Booting from a SCSI Drive

Follow these guidelines if you want your system to boot from a SCSI disk drive.

- If the drive is connected to an AHA-1540A/1542A/1540B/1542B, enable the BIOS on the host adapter at port 330h.
- If the drive is connected to an AHA-1540C/1542C, you can enable the BIOS for any valid port address.
- If you have an AHA-1640, enable the BIOS on a single host adapter at port 330h, 230h, or 130h. If other host adapters are installed, disable their BIOS.
- If you have an AHA-1740/1742/1744 in Enhanced Mode, use the configuration diskette to configure the board(s).

For the AHA-1540/1542 and the AHA-1640, the SCSI drive at ID 0 will be your boot device. For the AHA-1740/1742/1744 in Enhanced Mode, the boot device is configurable. Use DOS *fdisk* to create a small DOS partition (about 3-6 MBytes). Format the drive using DOS *format* (i.e., format c: /s) and boot to it. Copy these files to the root directory:

Diskette	Files
System-1	server.exe, install.nlm
ASW-1400 or ASW-1440	aha1540.dsk, aha1640.dsk, aha1740.dsk, aspitran.dsk

Modify your DOS *autoexec.bat* to run *server*.

Reboot the server. NetWare 386 v4.0 should boot up at this point. Enter your file server name and internal IPX number. Load *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk* for each host adapter in your system. Load *install.nlm* and create your *startup.ncf* and *autoexec.ncf,* following the directions in the following section.

startup.ncf and autoexec.ncf

startup.ncf and *autoexec.ncf* are two files that can be created so that when the NetWare 386 v4.0 file server is booted, drivers are automatically loaded, volumes are mounted, and the server is ready to service the workstations. These files are created or modified from the NetWare *install.nlm* program. Load *install.nlm.* and select **System Options**. Next, select from the **Available System Options**. The *autoexec.ncf* and *startup.ncf* files can be created or edited by selecting the appropriate menu choice.

A sample *autoexec.ncf* may look similar to:

```
file server name myfileserver
ipx internal net 2
mount all
load install
load monitor
```

Replace *myfileserver* with the desired file server name. Refer to the *NetWare Installation Manual* for an appropriate IPX internal net number.

The *startup.ncf* should look similar to:

```
load aha1540 port=330
```

Note: In order for *startup.ncf* to properly execute, the module *aspitran.dsk* must be in the same [*path*] as the driver *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk.*

Formatting Media

NetWare 386's *install.nlm* program lets you optionally format a disk drive. When using SCSI, it allows you to low-level format several SCSI drives simultaneously. When you select a drive to format, *install* prompts you for an interleave from one to nine. What it doesn't say is that you can also enter an interleave value of zero. This option was unavailable in NetWare 386 v3.0. When formatting SCSI disk drives or removable drives on the AHA-1540/1542, AHA-1640,

or AHA-1740/1742/1744, we recommend that you use an interleave value of zero. This value instructs the drive to use its optimal interleave value.

Removable Media

aha1540.dsk, *aha1640.dsk*, and *aha1740.dsk*, have full support for removable media disk drives including Magneto-Optical drives. Removable media is treated as a standard SCSI hard disk, with some exceptions. The driver will only recognize and register media with 512 bytes/sector.

NetWare 386 v4.0 allows you to mount/dismount the media, and to lock/unlock the media. These options are supported in the NetWare *monitor.nlm* program. Load this program to display the various options. Select **Disk Information**. All system disk drives will be displayed. Select the removable media device. The following drive status items will be displayed:

Menu Choice	Default Value
1. Volume Segments On Drive:	(select for list)
2. Read After Write Verify:	Hardware Level
3. Drive Light Status:	Not Supported
4. Driver Operating Status:	Active
5. Removable Drive Mount Status:	Mounted
6. Removable Drive Lock Status:	Not Locked

Menu choices 1-4 are valid for both removable and non-removable SCSI disk drives. Menu choices 5 and 6 are valid for removable media only.

Before you eject your current media, to insert new media, you should first dismount it (Option #5). NetWare will not allow you to dismount if the media is locked. When the media status is dismounted, you can eject the media. Insert your new media. Wait for the drive to spin up, and then select the mount option.

If your removable media device supports the lock/unlock feature, you can lock the media (Option #6). If the media is locked, the user can press the eject button, but the media will not be ejected. The media must be in the Not Locked state before you can eject it.

By default, the Read After Write Verify option is set to Hardware Level. This can be changed by changing Option 2, Read After Write Verify. This option can be specified in the *startup.ncf* or *autoexec.ncf* files with the following syntax:

```
:set enable disk read after write verify = ON/OFF
```

The available options are defined as follows:

Read After Write Verify Option	Function
Disabled	All writes to SCSI disk drives will be with the SCSI Write command (0Ah or 2Ah)
Hardware Level	All writes to SCSI disk drives will be with the SCSI Write and Verify command (2Eh), or if not supported by the drive, the SCSI Write command (0Ah or 2Ah) followed by the SCSI Verify command (2Fh)
Software Level	Not supported

Accessing More than 16 MBytes RAM

Normally, the AHA-1540/1542/1640 and AHA-1740/1742/1744 (Standard Mode) can only access up to 16 MBytes of memory in the file server, due to a hardware limitation of the AT bus. NetWare v4.0 and Adaptec's NetWare v4.0 driver allow this limitation to be overcome via software, and up to 4 GBytes of host memory can be installed.

If more than 16 MBytes are installed in the file server, edit the *startup.ncf* file to contain the following lines:

```
:set Auto Register Memory Above 16 Megabytes = OFF
:load aspitran
:load aha1540 port=330 above16 = y
```

Edit the *autoexec.ncf* file to contain the following lines:

```
:register memory 1000000 400000
```

The above example is for the AHA-1540B/1542B. The Register Memory command is documented by Novell NetWare. This example registers 4 MBytes of memory above 16 MBytes. If the driver fails to load, you may have to add the following line to the *startup.ncf* file:

```
:set Reserved Buffers Below 16 Meg = 32
```

This increases the reserved buffers below 16 MBytes to 32, which is required in some systems.

This option is not required if using the AHA-1740/1742/1744 in Enhanced Mode in an EISA machine, where up to 4 GBytes of host memory is supported by the EISA architecture and the *aha1740.dsk* driver.

NetWare Ready

In order for a drive and host adapter to be fully certified as NetWare Ready, they must both pass a qualification process that takes place before the user sees the product. The goals of NetWare Ready were to simplify installation and provide the highest quality disk subsystem.

Adaptec's host adapter boards and their respective NetWare 386 v4.0 drivers are fully NetWare Ready. This means that you can purchase a NetWare Ready drive from a vendor, connect it to your host adapter, partition it, and create a volume without any incompatibility concerns.

The *aha1540.dsk*, *aha1640.dsk*, and *aha1740.dsk* drivers are flexible enough to allow the user to place NetWare Ready SCSI drives as well as standard SCSI drives on a single host adapter. The drivers will register each drive accordingly. This is done transparently to the end user.

You can determine whether the driver has detected the drive as being NetWare Ready by the drive description string that is displayed from within *monitor.nlm* (Select Disk Options). The message NetWare Ready will be embedded in the drive description string.

Tape Backup Included with Novell NetWare

Included with Novell NetWare 4.0 is a server-based tape backup utility, *sbackup.nlm*, that allows you to backup the server disk drives to a tape drive attached to the server. *sbackup.nlm* supports Adaptec SCSI host adapters.

Once you have loaded the Adaptec ASPI Manager that is appropriate for your SCSI host adapter, then load *tsa.nlm* and *sbackup*, similar to the following example:

```
:load tsa
:load sbackup
```

The appropriate driver that interfaces *sbackup* to ASPI will be loaded automatically. You also need to load the device driver provided by the tape drive manufacturer.

See the *NetWare Server Backup Manual* for more information on loading and running the server tape backup software.

> **Note:** Novell also includes a driver called *adaptec.nlm*. This driver is not needed and should not be loaded if you have loaded the *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk* driver. *adaptec.nlm* interfaces directly with the host adapter hardware, bypassing the ASPI interface provided by Adaptec's NetWare 386 drivers.

Novell publishes a list of SCSI tape drives that are supported with *sbackup.nlm*.

NetWare 386 v4.0 Error Messages

Any error which occurs during initialization will cause the driver *not* to be loaded. If an error does occur, the driver will first *beep* the computer and then display a numbered error message in the following format:

ERR *xxx*:message

The *xxx* indicates the error code and message is a descriptive line describing the error. The error codes are broken up into these sections:

000-099: Non-Host Adapter Specific

100-199: Adaptec AHA-1540/1542/1640 Specific

200-299: Adaptec AHA-1740/1742/1744 Specific

300-999: Reserved

Error Codes - Non-Host Adapter Specific

000 Failed ParseDriverParameters call

A call to NetWare 386's *ParseDriverParameters* routine has failed for some unknown reason. The command line most likely contains some errors or the user pressed Esc at the port or slot prompt.

001 Unable to reserve hardware, possible conflict

The driver failed in its attempt to reserve the host adapter's hardware settings (i.e. DMA and IRQ settings). There may be another card in your system which would cause a conflict with the host adapter.

002 NetWare rejected card - Failed AddDiskSystem call

The driver failed in its attempt to register the host adapter with NetWare 386. You may not have enough memory in your file server.

003 Invalid command line option entered -> *option*

An invalid option was entered on the command line. The *option* field displays the invalid option which was entered.

004 Invalid command line, please enter correctly

The driver was unable to understand the command line options which were entered by the user. Please be sure you enter them correctly.

005 Unable to load driver - not enough memory?

The driver was unable to load itself. This was probably due to lack of memory.

Error Codes - AHA-1540/1542/1640 Specific

100 Invalid 'port' setting (enter in hex, i.e. 330)

You have entered an invalid port setting on the command line. There are six valid port settings: 334, 330, 234, 230, 134, 130 (i.e., port = 330). This option is only valid for the AHA-1540/1542.

101 Invalid 'slot' setting, use 1-8

You have entered an invalid slot setting on the command line. You can only enter slot numbers 1-8 (i.e., slot = 3). This option is only valid for the AHA-1640.

102 Invalid 'speed' setting, use 00-FF

You have entered an invalid speed setting on the command line. You can only enter hex numbers 00-FF (i.e., speed = 2). This option is only valid for the AHA-1540/1542.

103 Invalid 'bus_on' setting, use 2-15

You have entered an invalid bus_on setting on the command line. You can only enter decimal numbers 2-15 (i.e., bus_on = 9). This option is only valid for the AHA-1540/1542.

104 Invalid 'bus_off' setting, use 1-64

You have entered an invalid bus_off setting on the command line. You can only enter decimal numbers 1-64 (i.e., bus_off = 10). This option is only valid for the AHA-1540/1542.

105 Invalid 'verbose' setting, use 'y'

You can only enter y for this option (i.e., verbose = y).

106 'speed' option not valid for this host adapter

You have attempted to set the Bus Master DMA transfer rate on the AHA-1640/1740/1742/1744. The speed option is only valid for the AHA-1540/1542.

107 'port' option not valid for this host adapter

You have used the port option on the command line. You cannot use this option with your AHA-1640/1740/1742/1744. It is only valid for the AHA-1540/1542.

108 'slot' option not valid for this host adapter

You have used the slot option on the command line. You cannot use this option with the AHA-1540/1542. It is only valid for the AHA-1640/1740/1742/1744.

109 'bus_on' option not valid for this host adapter
110 'bus_off' option not valid for this host adapter

You have used the bus_on or bus_off option on the command line. You cannot use this option with your AHA-1640/1740/1742/1744. It is only valid for the AHA-1540/1542.

111 No host adapter found

The driver failed in its attempt to find a host adapter in your system. Please be sure the host adapter is properly installed.

112 Host adapter not found at given port location

The driver failed in its attempt to find a host adapter at the user-entered location. Please be sure you have entered the correct port address.

113 Unable to read host adapter configuration

The driver failed in its attempt to get the host adapter's configuration settings (Adapter Inquiry command). This error will only occur

with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

114 Unable to set host adapter bus master transfer rate

The driver failed in its attempt to set the host adapter's Bus Master DMA transfer rate. This error only occurs with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

115 Unable to set host adapter bus-on time

The driver failed in its attempt to set the host adapter's bus-on time. This error will only occur with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

116 Unable to set host adapter bus-off time

The driver failed in its attempt to set the host adapters bus-off time. This error will only occur with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

117 Unable to initialize host adapter's mailbox location

The driver failed in its attempt to initialize the host adapter's mailbox base address. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

118 Invalid 'removable' setting, use 'off'

You can only enter off for this option (i.e., removable = off).

119 Invalid 'fixed_disk' setting, use 'off'

You can only enter off for this option (i.e., fixed_disk = off).

Error Codes - AHA-1740/1742/1744 Specific

200 No host adapter found for this driver to register

No Adaptec AHA-1740/1742/1744 was found in your system for the driver to register. Please make sure the host adapter is properly inserted and configured.

201 Host adapter not configured for enhanced mode

The driver found an AHA-1740/1742/1744 but it is not configured for Enhanced Mode. Rather, it is set for Standard Mode (AHA-1540/1542 emulation mode). Please run your EISA configuration utility to set the host adapter into Enhanced Mode to use this driver.

202 Unable to read host adapter configuration
The driver failed to read the host adapter configuration data. Please make sure your host adapter is properly inserted.

203 Invalid 'slot' setting, use 1-15
You have entered an invalid slot setting on the command line. You can only enter slot numbers 1-15 (i.e., slot = 3).

204 Invalid 'verbose' setting, use 'y'
You can only enter y for this option (i.e., verbose = y).

205 Invalid 'removable' setting, use 'off'
You can only enter off for this option (i.e., removable = off).

206 Invalid 'fixed_disk' setting, use 'off'
You can only enter off for this option (i.e., fixed_disk = off).

3 NetWare 386 v3.11 Installation

About This Chapter

Read this chapter to find out:

- How to install Adaptec drivers for NetWare 386 v3.11
- The command line options that can be specified when the driver is loaded
- How NetWare 386 v3.11 drivers support the installation of multiple SCSI hard disk drives in the file server
- Information on booting a NetWare 386 server from SCSI, formatting media, using removable media, and accessing over 16 MBytes of RAM
- The meaning of error messages generated during initialization

▼▼▼▼ 3

Installing NetWare 386 v3.11

We recommend that you make backup copies of all Novell and Adaptec supplied diskettes using diskcopy and use those backup copies as your working diskettes.

Use the NetWare 386 v3.11 file *server.exe* to start the installation process. You will be prompted for a file server name and an IPX internal network number. Consult the *NetWare 386 User's Manual* for this information.

Installing a disk driver into NetWare 386 requires use of the load console command. The driver must be loaded for each host adapter in the system. For example, if you have three host adapters, you must load the driver three times. If the driver is reentrant, only one image of the driver will remain in memory (*aha1540.dsk*, *aha1640.dsk*, and *aha1740.dsk* are reentrant). The driver for the AHA-1540/1542 would be loaded:

:load [*pathname*] aha1540 [*parameters*]

When you load the driver, you need to specify which host adapter you are loading the driver for. For the AHA-1540/1542, you do this with the port = *xxx* command line (i.e., load AHA1540 port = 330). The driver will read the interrupt level and DMA channel from the host adapter and pass this information to the NetWare operating system.

For the AHA-1640 or AHA-1740/1742/1744, you specify the host adapter with the slot = *x* command line option (i.e., load AHA1640 slot = 3). The driver will read necessary host adapter information and pass this information to NetWare.

If you do not specify the port or slot setting, you will be prompted for one.

Command line options can be separated by spaces or commas, and they are not white-space sensitive.

NetWare will determine if loading the driver will cause any conflicts (i.e., two host adapters at DMA 5). If there is a possibility for a

conflict, the driver will not be loaded. The next section describes the valid command line options.

> **Note:** If you are installing more than one host adapter, each host adapter should have its own SCSI bus. For example, no two AHA-1540s should be connected to the same SCSI cable.

The NetWare 386 colon prompt (:) will now be displayed. Use the load command to install the driver. The correct syntax to load the AHA-1540/1542 driver is:

:load [*pathname*] aha1540 [*options*]

Note that this driver is also used for the AHA-1740/1742/1744 running in Standard Mode.

For the AHA-1640:

:load [*pathname*] aha1640 [*options*]

For the AHA-1740/1742/1744:

:load [*pathname*] aha1740 [*options*]

Note that the AHA-1740 driver is required only when running the EISA AHA-1740/1742/1744 in Enhanced Mode. In Standard Mode, use *aha1540.dsk*.

The *aspitran.dsk* module must also be in the same [*path*].

AHA-1540/1542

For an AHA-1540/1542, assuming the Adaptec NetWare driver diskette is in drive *A*, the screen should look similar to:

```
:load a:\netware\net386.311\aha1540   <ENTER>
Loading module AHA1540.DSK
   Adaptec AHA-1540/1542/1640 ASPI Manager & SCSI Disk Module
   Version 2.34
   Copyright 1992 Adaptec, Inc.   All rights reserved
   Auto-loading module ASPITRAN.DSK
   Adaptec NetWare 386 ASPI Transport Layer v1.0
Supported I/O port values are  330 ,  334 ,  234 ,  230 ,  134 ,  130
I/O port:  330    <ENTER>
```

Figure 3-1. Loading the AHA-1540/1542 Driver

To automate this procedure, you can enter:

load a:\netware\net386.311\aha1540 port=*xxx*

where *xxx* is the host adapter's port location.

Note that those port values which would cause a conflict with another device will *not* be displayed.

AHA-1640

For an AHA-1640, the screen should look similar to:

```
:load a:\netware\net386.311\aha1640   <ENTER>
Loading module AHA1640.DSK
   Adaptec AHA-1540/1542/1640 ASPI Manager & SCSI Disk Module
   Version 3.0
   Copyright 1992 Adaptec, Inc.   All rights reserved
   Auto-loading module ASPITRAN.DSK
   Adaptec NetWare 386 ASPI Transport Layer v1.0
Supported Slot values are  1 ,  2
Slot:  1  <ENTER>
```

Figure 3-2. Loading the AHA-1640 Driver

To automate this procedure, you can enter:

load a:\netware\net386.311\aha1640 slot=*x*

where *x* is the host adapter's slot location.

Note that those slot values which already have a registered device will *not* be displayed. Also, only those slots which actually have an AHA-1640 installed will be displayed.

AHA-1740/1742/1744

For an AHA-1740/1742/1744 (Enhanced Mode), the screen should look similar to:

```
:load a:\netware\net386.311\aha1740   <ENTER>
Loading module AHA1740.DSK
   Adaptec AHA-1740/1742/1744 ASPI Manager & SCSI Disk Module
   Version 2.0
   Copyright 1992 Adaptec, Inc.   All rights reserved
   Auto-loading module ASPITRAN.DSK
   Adaptec NetWare 386 ASPI Transport Layer v1.0
Supported Slot values are  2 ,  4
Slot:  2  <ENTER>
```

Figure 3-3. Loading the AHA-1740/1742/1744 Driver

To automate this procedure, you can enter:

```
load a:\netware\net386.311\aha1740 slot=x
```

where *x* is the host adapter's slot location.

Note that those slot values which already have a registered device will *not* be displayed. Also, only those slots which actually have an AHA-1740/1742/1744 installed will be displayed.

If you have multiple host adapters in your server, you must load the driver once for each host adapter (only one image of this reentrant driver stays in memory). Refer to the *NetWare Installation Manual* for information on installing other NetWare Loadable Modules (NLMs). If an error message appears when attempting to load the driver, see the end of this section for a description of the error messages.

Command Line Options

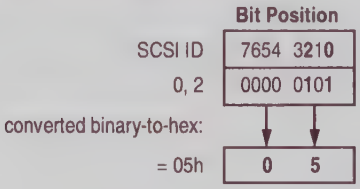
The following table lists and describes the command line options you can use to adjust the configuration of the Adaptec NetWare drivers:

Option	Values	Adapter	Description
port=	330h 334h 234h 230h 134h 130h	AHA-1540/1542	This option selects the host adapter's port address, which should correspond to the jumpered port address of the AHA-1540/1542. If none is given, the user will be prompted for one. Port 330h is the default value.
speed=	00-FFh	AHA-1540/1542	This option sets the AT Bus Master transfer speed. The pre-programmed speeds are: 0 = 5.0 MBytes/sec 1 = 6.7 MBytes/sec 2 = 8.0 MBytes/sec 3 = 10.0 MBytes/sec 4 = 5.7 MBytes/sec FF=3.3 MBytes/sec This option overrides the jumper settings. Keep in mind that some computers may not be able to handle the higher transfer speeds. The default is 5.0 MBytes/sec.
bus_on=	2-15	AHA-1540/1542	This option sets the host adapter's bus-on time. The units are in microseconds. If this option is not chosen, the default value of 11 microseconds is used.
bus_off=	1-64	AHA-1540/1542	This option sets the host adapter's bus-off time. The units are in microseconds. If this option is not chosen, the default value of 4 microseconds is used.
slot=	1-8 1-15	AHA-1640 AHA-1740/1742/1744	This option selects the host adapter's slot location. If none is given, the user will be prompted for one.
verbose=	y	AHA-1540/1542 AHA-1640 AHA-1740/1742/1744	This option causes the driver to display host adapter configuration information at load time.

Option	Values	Adapter	Description
removable=	off	AHA-1540/1542 AHA-1640 AHA-1740/1742/ 1744	This option disables support for removable media. (By default, removable media is supported.) You may want to disable removable disk support in order to load your own ASPI removable disk module.
fixed_disk=	off	AHA-1540/1542 AHA-1640 AHA-1740/1742/ 1744	This option disables support for fixed disk drives. (By default, fixed disk drives are supported.) You may want to disable fixed disk support in order to load your own ASPI fixed disk module.
dev_enable=	00-FFh	AHA-1540/1542 AHA-1640 AHA-1740/1742/ 1744	This option allows you to enable the driver's registration of SCSI devices on a per target basis. This enable mask is entered in hex. (see *Bit Mask Options* below)
above16=	y	AHA-1540/1542 AHA-1640	This option allows the host adapter to access RAM above 16 MBytes. Note: The AHA-1740/1742/1744 in Enhanced Mode can directly access up to 4 GBytes, and this option is not needed and should not be used.

Bit Mask Options

Use this example to aid in calculating bit-mask option hex values. Each SCSI device (ID 0-7) is enabled by a 1 in its corresponding bit position. In this example, dev_enable=05 enables driver registration of the devices at SCSI IDs 0 and 2:



The command line options are *not* case sensitive or white-space sensitive. Placing commas between command line options is optional.

Here is an example of the *aha1540.dsk* driver being loaded with command line options.

```
:load aha1540 port=330 verbose=y speed=0 <ENTER>
Loading module AHA1540.DSK
  Adaptec AHA-1540/1542 ASPI Manager & SCSI Disk Module
  Version 2.20
  Copyright 1992 Adaptec, Inc.  All rights reserved
  Auto-loading module ASPITRAN.DSK
  Adaptec NetWare 386 ASPI Transport Layer v1.0

  I/O Port Address:          330
  Interrupt Level:           11
  DMA Channel:               5
  Host Adapter SCSI ID:      7

  AT Bus Master Speed:       5.0 MBytes/second
  Optimization Mode:         2
  More than 16 Megs:         No
```

Figure 3-4. AHA-1540 Driver with Command Line Options

Here is an example of the *aha1740.dsk* driver being loaded with command line options.

```
:load aha1740 slot=1 verbose=y <ENTER>
Loading module AHA1740.DSK
  Adaptec AHA-1740/1744 ASPI Manager & SCSI Disk Module
  Version 1.20
  Copyright 1992 Adaptec, Inc.  All rights reserved
  Auto-loading module ASPITRAN.DSK
  Adaptec NetWare 386 ASPI Transport Layer v1.0

  EISA Slot #:               1
  Host Adapter SCSI ID:      7
  Interrupt Level:           11

  Shared Interrupts:         Enabled
  Firmware Type:             ENHANCED
  Firmware Revision:         02-25-91  REV C
```

Figure 3-5. AHA-1740 Driver with Command Line Options

Multiple Disk Drives

Adaptec's NetWare 386 v3.11 drivers support the installation of multiple SCSI hard disk drives in the file server. There are several reasons why you might want to use multiple hard disk drives:

- To support disk mirroring (fault tolerance)
- To support disk duplexing (fault tolerance)
- To increase total storage capacity of the system
- To install multiple drives per NetWare volume

Mirroring

Disk mirroring refers to two or more hard disks which contain the same data and which are installed on a single host adapter. If one disk fails, the other disk(s) will continue to function without interruption to the end user, thus minimizing network down time. Figure 3-6 illustrates disk mirroring with NetWare 386.

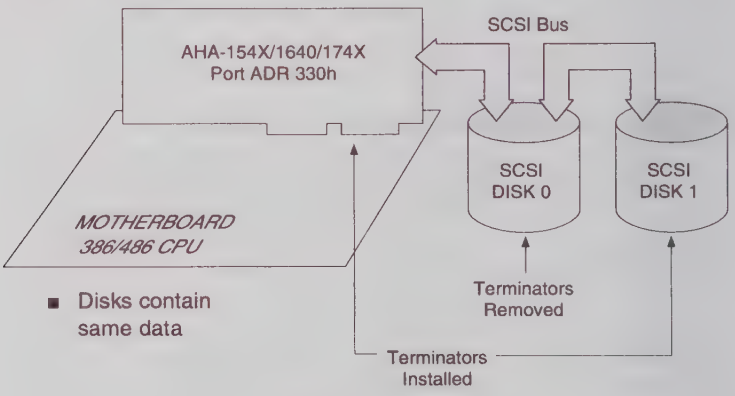


Figure 3-6. Disk Mirroring

You should take the following hardware considerations into account when you prepare disk drives for mirroring:

- The NetWare partitions should be nearly the same size. NetWare will not allow partitions that vary greatly in size to be mirrored. Refer to the *NetWare Installation Manual* for the limitations.

- The drives must be connected to the same SCSI cable on the same host adapter.
- The drives must have different SCSI IDs.
- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other SCSI devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the on-board terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

The NetWare procedure for installing a mirrored pair of disk drives is similar to the Standard installation procedure. The *install.nlm* module should be loaded from the console. This must be done after the *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk* has been loaded.

1 Enter load install. The screen should look similar to:

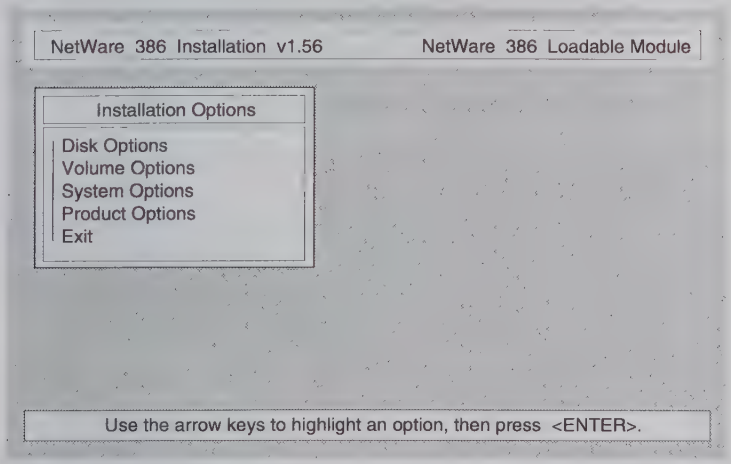


Figure 3-7. NetWare Installation Options

2 Select **Disk Options**. The screen should look similar to:

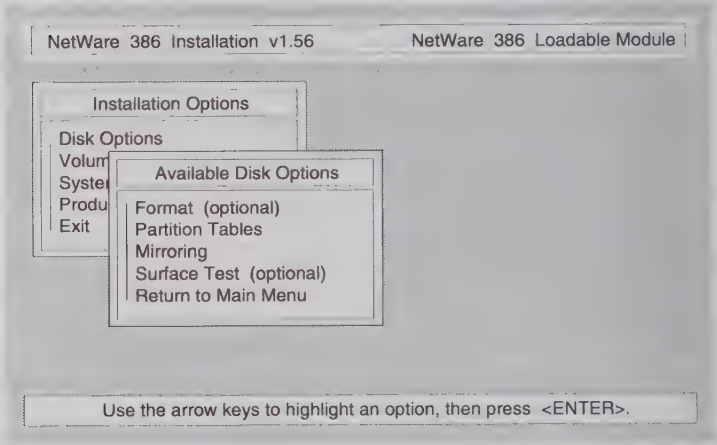


Figure 3-8. Available Disk Options

3 Select **Partition Tables**. The screen should look similar to:

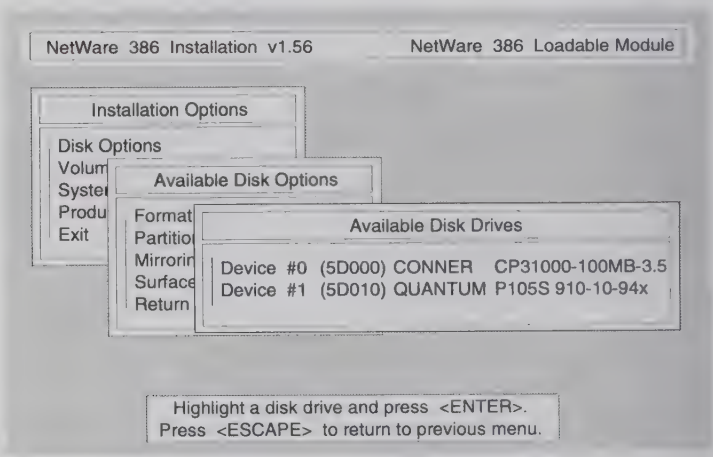


Figure 3-9. Available Disk Drives

The screen should display the installed disk drives. Refer to the *NetWare 386 Installation Manual* to learn how to create partitions on each drive.

4 After each drive has a NetWare partition on it, return to the **Available Disk Options** menu and select **Mirroring**. The screen should look similar to:

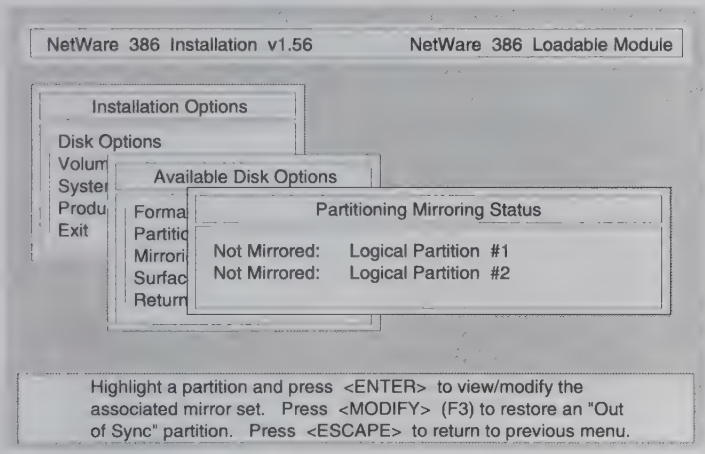


Figure 3-10. Partitioning Mirroring Status

5 Select **Not Mirrored: Logical Partition #1**, which in this case is the Quantum Pro 105S. The screen should look similar to:

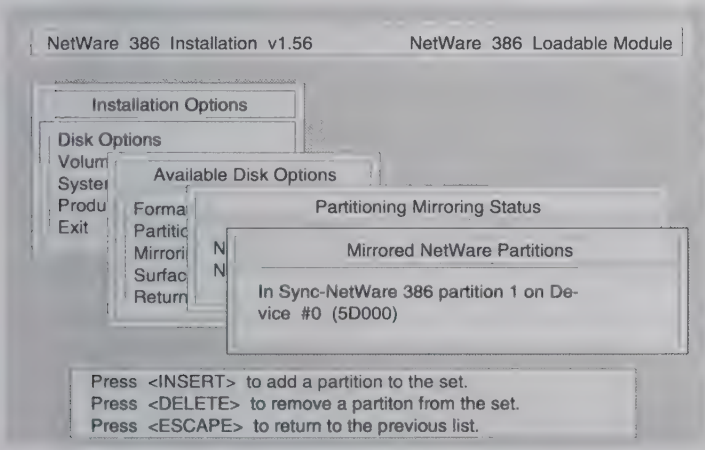


Figure 3-11. Mirrored NetWare Partitions

6 Press **Insert.** The screen should look similar to:

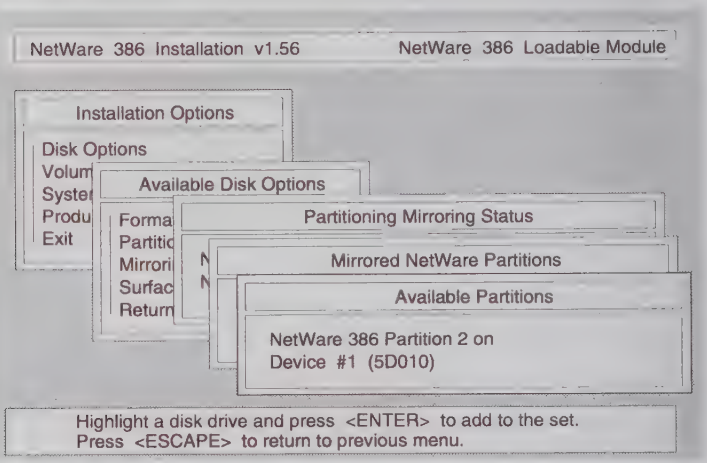

NetWare 386 Installation v1.56
NetWare 386 Loadable Module
Installation Options
Disk Options
Available Disk Options
Partitioning Mirroring Status
Mirrored NetWare Partitions
Available Partitions
NetWare 386 Partition 2 on
Device #1 (5D010)
Highlight a disk drive and press <ENTER> to add to the set.
Press <ESCAPE> to return to previous menu.

Figure 3-12. Available Partitions

7 Press **Enter,** then **Esc**. The screen should look similar to:

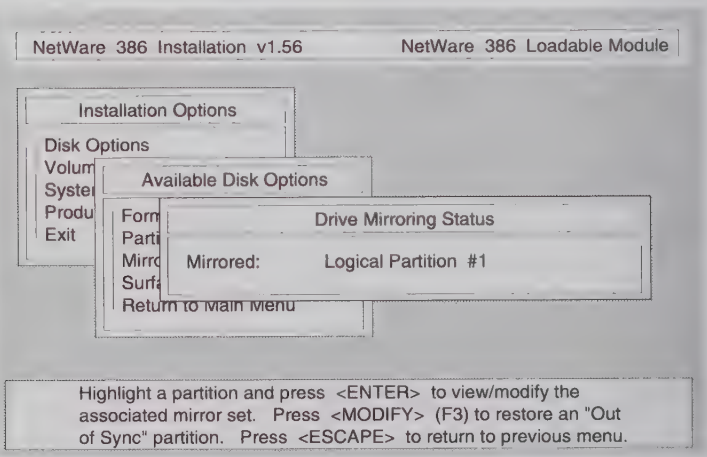

NetWare 386 Installation v1.56
NetWare 386 Loadable Module
Installation Options
Disk Options
Available Disk Options
Drive Mirroring Status
Mirrored: Logical Partition #1
Highlight a partition and press <ENTER> to view/modify the
associated mirror set. Press <MODIFY> (F3) to restore an "Out
of Sync" partition. Press <ESCAPE> to return to previous menu.

Figure 3-13. Drive Mirroring Status

The drives are now mirrored. Press **Esc** several times to exit the *Install* program.

Duplexing

Disk duplexing means that two host adapters are installed in a single file server, each with its own disk mirrored together. These disk drives contain the same data. This ensures that if either one disk or one host adapter fails, the server will continue to operate. Figure 3-14 illustrates disk duplexing with NetWare 386.

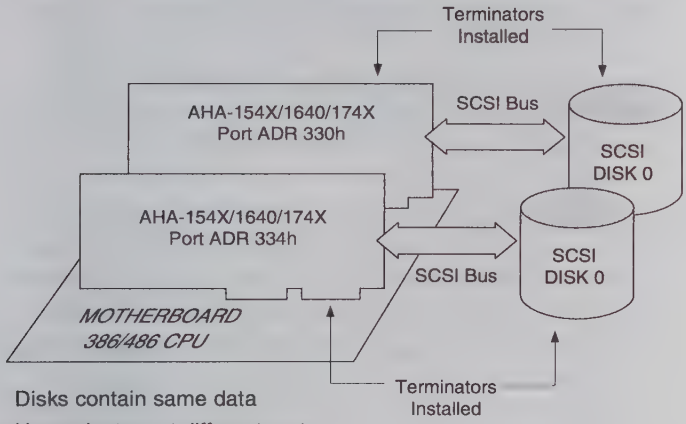


Figure 3-14. Disk Duplexing

Mirroring and duplexing are both referred to as *mirroring* in the NetWare operating system. During the installation part of NetWare, the drive mirroring status will display either Not Mirrored or Mirrored. These drives may be on the same host adapter (mirroring) or on separate host adapters (duplexing). Therefore, the procedure to mirror or duplex is exactly the same, as far as NetWare is concerned. The only difference is the hardware setup (one vs. two host adapters).

You should take the following hardware considerations into account when you prepare the disk drives for duplexing:

- The NetWare partitions should be nearly the same size. NetWare will not allow partitions that vary greatly in size to be mirrored. Refer to the *NetWare Installation Manual* for the limitations.

- Each drive must be connected to its own host adapter, and each host adapter must have its own SCSI cable.
- If both host adapters have floppy controllers (AHA-1542 or AHA-1742), one of the floppy controllers must be disabled.
- The interrupt channels (referred to as *interrupt level* with the AHA-1640) must be different on the two host adapters. See the instructions in your host adapter documentation if you need to change the interrupt channel.
- The DMA channels (referred to as *arbitration level* with the AHA-1640) must be different on the two host adapters. See the instructions in your host adapter documentation if you need to change the DMA channel.
- The host adapter BIOS must be set correctly, depending on which models of host adapters are installed and how your system is configured. (See the instructions in your host adapter documentation if you need to change the BIOS setting):
  - For AHA-1540A/1542A/1540B/1542B or AHA-1640 host adapters, the BIOS must be enabled on only *one* board.
  - For AHA-1740/1742/1744 or AHA-1540C/1542C host adapters, the BIOS may be enabled on *any or all* boards.
  - If you want the system to boot from the SCSI drive, the drive SCSI ID must be 0 and the BIOS must be enabled on the host adapter to which the drive is connected. See *Booting from a SCSI Drive* on page 3-18 for more information.
  - If you do not want to boot from the SCSI drive, you can disable the BIOS on all installed AHA-1540/1542/1640 host adapters. You do not need to disable the BIOS on installed AHA-1740/1742/1744 host adapters, even if your system does not boot from a SCSI disk drive.
- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the on-board terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

The procedure for duplexing requires that the NetWare 386 driver be loaded twice. The screen should look similar to:

```
:load AHA1540 port=330 <ENTER>
Loading module AHA1540.DSK
   Adaptec AHA-1540/1542/1640 ASPI Manager & SCSI Disk Module
   Version 2.34
   Copyright 1992 Adaptec, Inc.  All rights reserved
   Auto-loading module ASPITRAN.DSK
   Adaptec NetWare 386 ASPI Transport Layer v1.0
:load AHA1540 port=334 <ENTER>
Loading module AHA1540.DSK
   Adaptec AHA-1540/1542/1640 ASPI Manager & SCSI Disk Module
   Version 2.34
   Copyright 1992 Adaptec, Inc.  All rights reserved
```

Figure 3-15. Loading the Driver Twice

The NetWare procedure for installing a duplexed pair of disk drives is the same as for the mirrored installation. Follow the directions described in *Mirroring* on page 3-10.

Special Considerations

This section deals with these topics:

- Booting a NetWare 386 server from a SCSI drive
- Formatting media
- Using removable media
- Accessing more than 16 MBytes of RAM
- Using Adaptec's NetWare Ready drivers and host adapters
- Performing tape backups under Novell NetWare

Booting from a SCSI Drive

Follow these guidelines if you want your system to boot from a SCSI disk drive.

- If the drive is connected to an AHA-1540A/1542B/1540B/1542B, enable the BIOS on the host adapter at port 330h.
- If the drive is connected to an AHA-1540C/1542C, you can enable the BIOS for any valid port address.
- If you have an AHA-1640, enable the BIOS on a single host adapter at port 330h, 230h, or 130h. If other host adapters are installed, disable their BIOS.
- If you have an AHA-1740/1742/1744 in Enhanced Mode, use the configuration diskette to configure the board(s).

For the AHA-1540/1542 and the AHA-1640, the SCSI drive at ID 0 will be your boot device. For the AHA-1740/1742/1744 in Enhanced Mode, the boot device is configurable. Use DOS *fdisk* to create a small DOS partition (about 3-6 MBytes). Format the drive using DOS *format* (i.e., format c: /s) and boot to it. Copy these files to the root directory:

Diskette	Files
System-1	server.exe, install.nlm
ASW-1400 or ASW-1440	aha1540.dsk, aha1640.dsk, aha1740.dsk, aspitran.dsk

Modify your DOS *autoexec.bat* to run *server.*

Reboot your server. NetWare 386 v3.11 should boot up at this point. Enter your file server name and internal IPX number. Load *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk* for each host adapter in your system. Load *install.nlm* and create your *startup.ncf* and *autoexec.ncf*. The next section will help you create these two files.

startup.ncf and autoexec.ncf

startup.ncf and *autoexec.ncf* are two files that can be created so that when the NetWare 386 v3.11 file server is booted, drivers are automatically loaded, volumes are mounted, and the server is ready to service the workstations. These files are created or modified from the NetWare *install.nlm* program. Load *install.nlm*. and select **System Options**. Next, select from the **Available System Options**. The *autoexec.ncf* and *startup.ncf* files can be created or edited by selecting the appropriate menu choice.

A sample *autoexec.ncf* may look similar to:

```
file server name myfileserver
ipx internal net 2
mount all
load install
load monitor
```

Replace *myfileserver* with the desired file server name. Refer to the *NetWare Installation Manual* for an appropriate IPX internal net number.

The *startup.ncf* should look similar to:

```
load aha1540 port=330
```

> **Note:** In order for *startup.ncf* to properly execute, the module *aspitran.dsk* must be in the same [*path*] as the driver *aha1540.dsk, aha1640.dsk,* or *aha1740.dsk*.

Formatting Media

NetWare 386's *install.nlm* program lets you optionally format a disk drive. When using SCSI, it allows you to low-level format several SCSI drives simultaneously. When you select a drive to format, *install* prompts you for an interleave from one to nine. What it doesn't say is that you can also enter an interleave value of zero. This option was unavailable in NetWare 386 v3.0. When formatting SCSI

disk drives or removable drives on the AHA-1540/1542, AHA-1640, or AHA-1740/1742/1744, we recommend that you use an interleave value of zero. This value instructs the drive to use its optimal interleave value.

Removable Media

aha1540.dsk, *aha1640.dsk*, and *aha1740.dsk*, have full support for removable media disk drives including Magneto-Optical drives. Removable media is treated as a standard SCSI hard disk, with some exceptions. The driver will only recognize and register media with 512 bytes/sector.

NetWare 386 v3.11 allows you to mount/dismount the media, and to lock/unlock the media. These options are supported in the NetWare *monitor.nlm* program. Load this program to display the various options. Select **Disk Information**. All system disk drives will be displayed. Select the removable media device. The following drive status items will be displayed:

Menu Choice	Default Value
1. Volume Segments On Drive:	(select for list)
2. Read After Write Verify:	Hardware Level
3. Drive Light Status:	Not Supported
4. Driver Operating Status:	Active
5. Removable Drive Mount Status:	Mounted
6. Removable Drive Lock Status:	Not Locked

Menu choices 1-4 are valid for both removable and non-removable SCSI disk drives. Menu choices 5 and 6 are valid for removable media only.

Before you eject your current media, to insert new media, you should first dismount it (Option #5). NetWare will not allow you to dismount if the media is locked. When the media status is dismounted, you can eject the media. Insert your new media. Wait for the drive to spin up, and then select the mount option.

If your removable media device supports the lock/unlock feature, you can lock the media (Option #6). If the media is locked, the user can press the eject button, but the media will not be ejected. The media must be in the Not Locked state before you can eject it.

By default, the Read After Write Verify option is set to Hardware Level. This can be changed by changing Option 2, Read After Write Verify. This option can be specified in the *startup.ncf* or *autoexec.ncf* files with the following syntax:

```
:set enable disk read after write verify = ON/OFF
```

The available options are defined as follows:

Read After Write Verify Option	Function
Disabled	All writes to SCSI disk drives will be with the SCSI Write command (0Ah or 2Ah)
Hardware Level	All writes to SCSI disk drives will be with the SCSI Write and Verify command (2Eh), or if not supported by the drive, the SCSI Write command (0Ah or 2Ah) followed by the SCSI Verify command (2Fh)
Software Level	Not supported

Accessing More than 16 MBytes RAM

Normally, AHA-1540/1542/1640 host adapters and AHA-1740/1742/1744 in Standard Mode can only access up to 16 MBytes of memory in the file server, due to a hardware limitation of the AT bus. NetWare v3.11 and Adaptec's NetWare v3.11 driver allow this limitation to be overcome via software, and up to 4 GBytes of host memory can be installed.

If more than 16 MBytes are installed in the file server, edit the *startup.ncf* file to contain the following lines:

```
:set Auto Register Memory Above 16 Megabytes = OFF
:load aspitran
:load aha1540 port=330 above16 = y
```

Edit the *autoexec.ncf* file to contain the following lines:

```
:register memory 1000000 400000
```

The above example is for the AHA-1540B/1542B. The Register Memory command is documented by Novell NetWare. This example registers 4 MBytes of memory above 16 MBytes. If the driver fails to load, you may have to add the following line to the *startup.ncf* file:

```
:set Reserved Buffers Below 16 Meg = 32
```

This increases the reserved buffers below 16 MBytes to 32, which is required in some systems.

This option is not required if using the AHA-1740/1742/1744 in Enhanced Mode in an EISA machine, where up to 4 GBytes of host memory is supported by the EISA architecture and the *aha1740.dsk* driver.

NetWare Ready

In order for a drive and host adapter to be fully certified as NetWare Ready, they must both pass a qualification process that takes place before the user sees the product. The goals of NetWare Ready were to simplify installation and provide the highest quality disk subsystem.

Adaptec's host adapter boards and their respective drivers are fully NetWare Ready. This means that you can purchase a NetWare Ready drive from a vendor, connect it to your host adapter, partition it, and create a volume without any incompatibility concerns.

The *aha1540.dsk*, *aha1640.dsk*, and *aha1740.dsk* drivers are flexible enough to allow the user to place NetWare Ready SCSI drives as well as standard SCSI drives on a single host adapter. The drivers will register each drive accordingly. This is done transparently to the end user.

You can determine whether the driver has detected the drive as being NetWare Ready by the drive description string that is displayed from within *monitor.nlm* (Select Disk Options). The message NetWare Ready will be embedded in the drive description string.

Tape Backup Included with Novell NetWare

Included with Novell NetWare v3.11 is a server-based tape backup utility called *sbackup.nlm*. This allows you to backup the server disk drives to a tape drive attached to the server. *sbackup.nlm* supports Adaptec SCSI host adapters.

Novell NetWare documentation contains instructions for loading the server backup software. Refer to page 9 of the *NetWare Server Backup Manual* to load the *tsa* and *sbackup* modules.

Once you have loaded the Adaptec ASPI Manager that is appropriate for your SCSI host adapter, then load *tsa.nlm* and *sbackup*, similar to the following example:

```
:load tsa
:load sbackup
```

The appropriate driver that interfaces *sbackup* to ASPI will be loaded automatically.

When *sbackup* is loaded, it will ask for a login name (enter the appropriate name). It will also ask you to select the device driver. Select the **HP DIBI-2 Tape Driver**, regardless of the type of SCSI tape drive being attached (i.e., even if the tape drive is manufactured by Wangtek, do not select the Wangtek driver).

> **Note:** Novell also includes a driver called *adaptec.nlm*. This driver is not needed and should not be loaded if you have loaded the *aha1540.dsk*, *aha1640.dsk*, or *aha1740.dsk* driver. *adaptec.nlm* interfaces directly with the host adapter hardware, bypassing the ASPI interface provided by Adaptec's NetWare 386 drivers.

Novell publishes a list of SCSI tape drives supported with *sbackup.nlm*.

NetWare 386 v3.11 Error Messages

Any error which occurs during initialization will cause the driver *not* to be loaded. If an error does occur, the driver will first *beep* the computer and then display a numbered error message in the following format:

ERR *xxx*:message

The *xxx* indicates the error code and message is a descriptive line describing the error. The error codes are broken up into these sections:

000-099: Non-Host Adapter Specific

100-199: Adaptec AHA-1540/1542/1640 Specific

200-299: Adaptec AHA-1740/1742/1744 Specific

300-999: Reserved

Error Codes - Non-Host Adapter Specific

000 Failed ParseDriverParameters call

A call to NetWare 386's *ParseDriverParameters* routine has failed for some unknown reason. The command line most likely contains some errors or the user pressed Esc at the port or slot prompt.

001 Unable to reserve hardware, possible conflict

The driver failed in its attempt to reserve the host adapter's hardware settings (i.e. DMA and IRQ settings). There may be another card in your system which would cause a conflict with the host adapter.

002 NetWare rejected card - Failed AddDiskSystem call

The driver failed in its attempt to register the host adapter with NetWare 386. You may not have enough memory in your file server.

003 Invalid command line option entered -> *option*

An invalid option was entered on the command line. The *option* field displays the invalid option which was entered.

004 Invalid command line, please enter correctly

The driver was unable to understand the command line options which were entered by the user. Please be sure you enter them correctly.

005 Unable to load driver - not enough memory?

The driver was unable to load itself. This was probably due to lack of memory.

Error Codes - AHA-1540/1542/1640 Specific

100 Invalid 'port' setting (enter in hex, i.e., 330)

You have entered an invalid port setting on the command line. There are six valid port settings: 334, 330, 234, 230, 134, 130 (i.e., port = 330). This option is only valid for the AHA-1540/1542.

101 Invalid 'slot' setting, use 1-8

You have entered an invalid slot setting on the command line. You can only enter slot numbers 1-8 (i.e., slot = 3). This option is only valid for the AHA-1640.

102 Invalid 'speed' setting, use 00-FF

You have entered an invalid speed setting on the command line. You can only enter hex numbers 00-FF (i.e., speed = 2). This option is only valid for the AHA-1540/1542.

103 Invalid 'bus_on' setting, use 2-15

You have entered an invalid bus_on setting on the command line. You can only enter decimal numbers 2-15 (i.e., bus_on = 9). This option is only valid for the AHA-1540/1542.

104 Invalid 'bus_off' setting, use 1-64

You have entered an invalid bus_off setting on the command line. You can only enter decimal numbers 1-64 (i.e., bus_off = 10). This option is only valid for the AHA-1540/1542.

105 Invalid 'verbose' setting, use 'y'

You can only enter y for this option (i.e., verbose = y).

106 'speed' option not valid for this host adapter

You have attempted to set the Bus Master DMA transfer rate on the AHA-1640/1740/1742/1744. The speed option is only valid for the AHA-1540/1542.

107 'port' option not valid for this host adapter

You have used the port option on the command line. You cannot use this option with your AHA-1640/1740/1742/1744. It is only valid for the AHA-1540/1542.

108 'slot' option not valid for this host adapter

You have used the slot option on the command line. You cannot use this option with the AHA-1540/1542. It is only valid for the AHA-1640/1740/1742/1744.

109 'bus_on' option not valid for this host adapter
110 'bus_off' option not valid for this host adapter

You have used the bus_on or bus_off option on the command line. You cannot use this option with your AHA-1640/1740/1742/1744. It is only valid for the AHA-1540/1542.

111 No host adapter found

The driver failed in its attempt to find a host adapter in your system. Please be sure the host adapter is properly installed.

112 Host adapter not found at given port location

The driver failed in its attempt to find a host adapter at the user-entered location. Please be sure you have entered the correct port address.

113 Unable to read host adapter configuration

The driver failed in its attempt to get the host adapter's configuration settings (Adapter Inquiry command). This error will only occur

with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

114 Unable to set host adapter bus master transfer rate

The driver failed in its attempt to set the host adapter's Bus Master DMA transfer rate. This error will only occur with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

115 Unable to set host adapter bus-on time

The driver failed in its attempt to set the host adapter's bus-on time. This error will only occur with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

116 Unable to set host adapter bus-off time

The driver failed in its attempt to set the host adapters bus-off time. This error will only occur with the AHA-1540/1542. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

117 Unable to initialize host adapter's mailbox location

The driver failed in its attempt to initialize the host adapter's mailbox base address. Make sure there are no hardware conflicts within your PC and that the host adapter is securely inserted.

118 Invalid 'removable' setting, use 'off'

You can only enter off for this option (i.e., removable = off).

119 Invalid 'fixed_disk' setting, use 'off'

You can only enter off for this option (i.e., fixed_disk = off).

Error Codes - AHA-1740/1742/1744 Specific

200 No host adapter found for this driver to register

No Adaptec AHA-1740/1742/1744 was found in your system for the driver to register. Please make sure the host adapter is properly inserted and configured.

201 Host adapter not configured for enhanced mode

The driver found an AHA-1740/1742/1744 but it is not configured for Enhanced Mode. Rather, it is set for Standard Mode (AHA-1540/1542 emulation mode). Please run your EISA configuration utility to set the host adapter into Enhanced Mode to use this driver.

202 Unable to read host adapter configuration
The driver failed to read the host adapter configuration data. Please make sure your host adapter is properly inserted.

203 Invalid 'slot' setting, use 1-15
You have entered an invalid slot setting on the command line. You can only enter slot numbers 1-15 (i.e., slot = 3).

204 Invalid 'verbose' setting, use 'y'
You can only enter y for this option (i.e., verbose = y).

205 Invalid 'removable' setting, use 'off'
You can only enter off for this option (i.e., removable = off).

206 Invalid 'fixed_disk' setting, use 'off'
You can only enter off for this option (i.e., fixed_disk = off).

4 NetWare 286 Installation

About This Chapter

Read this chapter to find out:

- How to install the Adaptec drivers for NetWare 286 v2.2 and v2.15
- Answers to commonly asked questions about NetWare 286
- The error messages and their meanings when a fatal error occurs

▼▼▼▼ 4

Installing NetWare 286

We recommend that you make backup copies of all Novell and Adaptec supplied diskettes using diskcopy and use those backup copies as your working diskettes.

NetWare 286 v2.15 and v2.2 are both supported by the Adaptec supplied NetWare 286 drivers. The installation procedure for these different versions varies significantly, and both procedures are described here.

Both NetWare 286 v2.15 and v2.2 support the installation of multiple SCSI hard disk drives in the file server. There are several reasons why you might want to use multiple hard disk drivess:

- To support disk mirroring (fault tolerance)
- To support disk duplexing (fault tolerance)
- To take advantage of the multitasking capability of the host adapter (performance)
- To add total storage capacity to the system

> **Note:** Disk mirroring and disk duplexing are supported only on SFT versions of NetWare.

Hardware considerations for disk mirroring are described in *Mirroring* on page 4-4; hardware considerations for duplexing are described in *Duplexing* on page 4-5; and hardware considerations for multitasking are described in *Multiple Channels - Multitasking* on page 4-7. Details on setting up these features for NetWare 286 v2.15 and v2.2 are included in later sections of this chapter.

Mirroring

Disk mirroring refers to two or more hard disks which contain the same data and which are installed on a single host adapter. If one disk fails, the other disk(s) will continue to function without interruption to the end users, thus minimizing network down time. Figure 4-1 illustrates disk mirroring with NetWare 286.

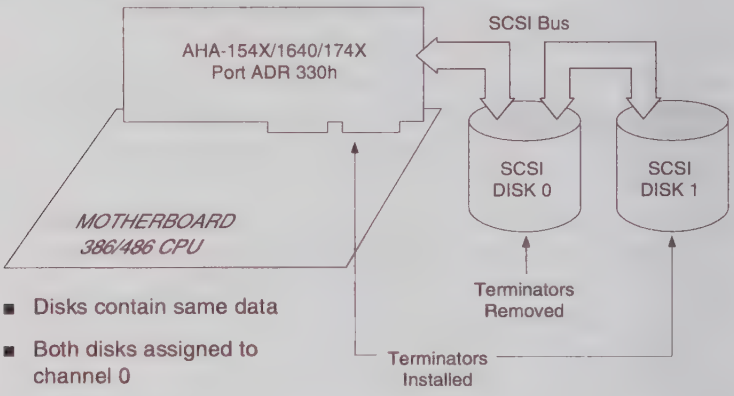


Figure 4-1. Disk Mirroring

You should take the following hardware considerations into account when you prepare the disk drives for mirroring:

- NetWare 286 v2.15 will not allow drives that vary greatly in capacity to be mirrored. With v2.2, the drives can be different sizes, but the volume sizes must be the same (volume size is changed on the **File Server Definition** screen). See the *NetWare Installation Manual* for more information about these limitations.
- The drives must be on the same SCSI bus on the same host adapter.
- The drives must have different SCSI IDs.

  Note: If you want your system to boot from one of the SCSI drives, its SCSI ID must be set to 0 and the port address of the host adapter to which it is connected should be 330h. (AHA-1540C/1542C host adapters, however, can boot from any port address.)

- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other SCSI devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the on-board terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

Duplexing

Disk duplexing means that two host adapters are installed in a single file server, each with its own disk mirrored together. These disk drives contain the same data. This ensures that if either one disk or one host adapter fails the server will continue to operate. Figure 4-2 illustrates disk duplexing with NetWare 286.

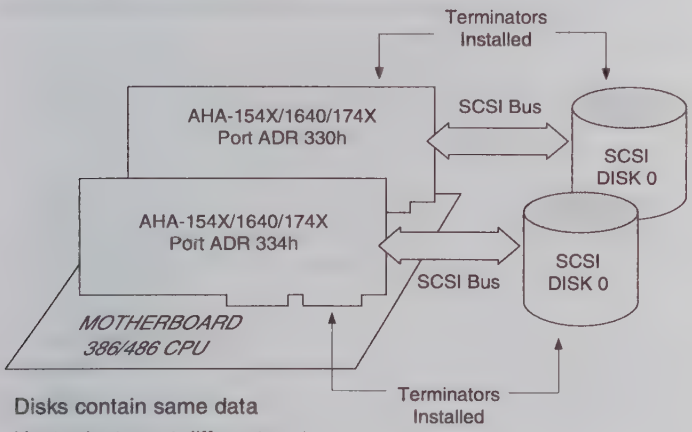


Figure 4-2. Disk Duplexing

Mirroring and duplexing are both referred to as *mirroring* in the NetWare operating system. During the installation part of NetWare, the user will be prompted whether or not to Establish Mirror Pair if two hard disk drives are detected that are of nearly the same capacity. These drives may be on the same host adapter (mirroring) or on separate host adapters (duplexing). Therefore, the procedure to mirror or to duplex is exactly the same as far as NetWare is concerned. The only difference is the hardware setup (one vs. two host adapters).

The following hardware considerations should be taken into account when preparing the disk drives for duplexing:

- NetWare 286 v2.15 will not allow drives that vary greatly in capacity to be duplexed (mirrored). With v2.2, the drives can be different sizes, but the volume sizes must be the same (volume size is changed on the **File Server Definition** screen). See the *NetWare Installation Manual* for more information about these limitations.
- Each drive must be connected to its own host adapter, and each host adapter must have its own SCSI cable.
- If both host adapters have floppy controllers (AHA-1542 or AHA-1742), one of the floppy controllers must be disabled.
- The interrupt channels (referred to as *interrupt level* with the AHA-1640) must be different on the two host adapters. See the instructions in your host adapter documentation if you need to change the interrupt channel. Be sure the interrupt channels do not conflict with the interrupt channel used by the floppy controller or any other board in the system.
- The DMA channels (referred to as *arbitration level* with the AHA-1640) must be different on the two host adapters. See the instructions in your host adapter documentation if you need to change the DMA channel.
- The host adapter BIOS must be set correctly, depending on which models of host adapters are installed and how your system is configured. (See the instructions in your host adapter documentation if you need to change the BIOS setting):
  - For AHA-1540A/1542A/1540B/1542B or AHA-1640 host adapters, the BIOS must be enabled on only *one* board.
  - For AHA-1740/1742/1744 or AHA-1540C/1542C host adapters, the BIOS may be enabled on *any or all* boards.
  - If you want the system to boot from the SCSI drive, the drive SCSI ID must be 0 and the BIOS must be enabled on the host adapter to which the drive is connected.
  - If you do not want to boot from the SCSI drive, you can disable the BIOS on all installed AHA-1540/1542/1640 host adapters. You do not need to disable the BIOS on installed

AHA-1740/1742/1744 host adapters, even if your system does not boot from a SCSI disk drive.

- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the on-board terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

Multiple Channels - Multitasking

When a host adapter has more than one disk drive connected, a performance increase can be realized by assigning each drive to its own channel. This allows for multitasking on the SCSI bus (because NetWare 286 can only do one I/O per channel at a time).

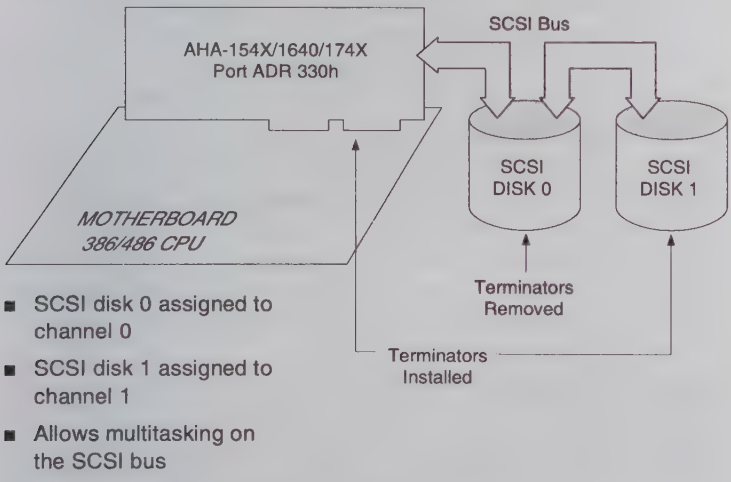


Figure 4-3. Multitasking

The Adaptec NetWare 286 drivers allow you to configure multiple channels per host adapter, thus allowing multitasking on the SCSI bus. This is done by allowing the user to map a channel to a drive rather than a channel to a host adapter. NetWare 286 can perform only one I/O per channel at a time.

The following hardware considerations should be taken into account when creating multiple channels per host adapter:

- The drives must be connected on the same SCSI cable on the same host adapter.
- Drives must be assigned different SCSI IDs if they are on the same SCSI bus.

  Note: If you want the system to boot from one of the SCSI drives, its SCSI ID must be set to 0 and the port address of the host adapter should be set to 330h. (AHA-1540C/1542C host adapters, however, can boot from any port address.)

- Terminators must be installed on the SCSI devices at the ends of the SCSI cable and removed from all other devices on that SCSI cable. The Adaptec host adapter is considered a SCSI device; host adapter termination must be disabled (or the onboard terminators must be removed) if devices are connected to *both* the internal and external SCSI connectors.

The NetWare procedure for assigning multiple channels per host adapter is similar to the standard installation. The only difference is in the *Select Disk Drivers* section of the installation. The host adapter driver should be loaded once for each hard disk drive to map those disk drives to a channel. Not all the hard disk drives on the SCSI bus need to be assigned a channel (e.g., some drives on the host adapter may be assigned a separate channel, others may not be).

Installing NetWare 286 v2.2

NetWare 286 can be installed from floppy disk, hard disk, or a network drive. The installation procedure for the hard disk and network drive methods involves copying the files from the Novell-supplied diskettes onto the hard disk in subdirectories with names matching the disk volume label. This should be done using the NetWare program *upload.exe* on the System-1 diskette. *upload.exe* will copy the NetWare-supplied diskettes into the appropriate subdirectories that it creates.

Create an additional subdirectory named *dsk_drv_.209* and copy the Adaptec-supplied NetWare 286 drivers into this subdirectory. Use either v3.1 or v3.2 of the Adaptec NetWare 286 drivers, as desired. The v3.1 driver is Novell certified, and the v3.2 driver can

be used at Arbitration Level 4 on the AHA-1640. Aside from these differences, the drivers are identical.

When installing NetWare from floppy disks, you need to create a floppy with the Adaptec driver on it. Copy the NetWare driver (either v3.1 or v3.2) from the Adaptec diskette to the root directory of the new floppy. Give the new floppy a volume label of *dsk_drv_209* (use either the DOS *label.com* or the /v switch on *format.exe*). During the installation procedure when a Channel # is selected, *install.exe* will prompt for a dsk_drv_??? driver. Select this option and the floppy will be read. This is how the Adaptec driver is loaded via the diskette method.

install.exe is the NetWare program used to create the file server. It is on the System-1 diskette or in the main directory to which the NetWare files were uploaded using *upload.exe*.

1 Run *install*. The screen should look similar to:

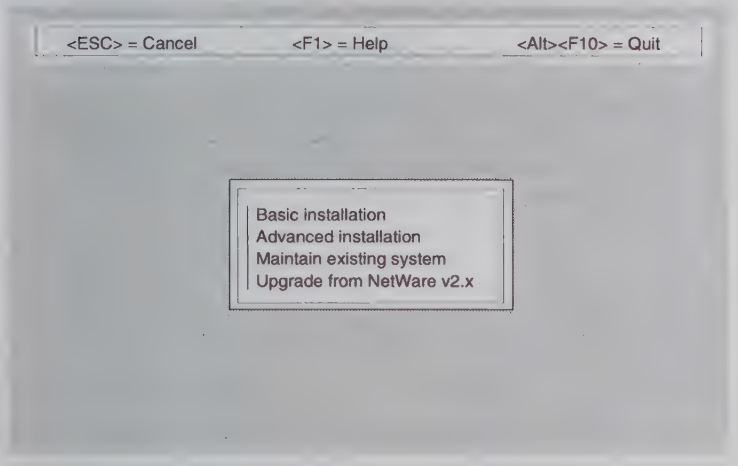


Figure 4-4. NetWare Installation Options

2 Select **Advanced installation**. The screen should look similar to:

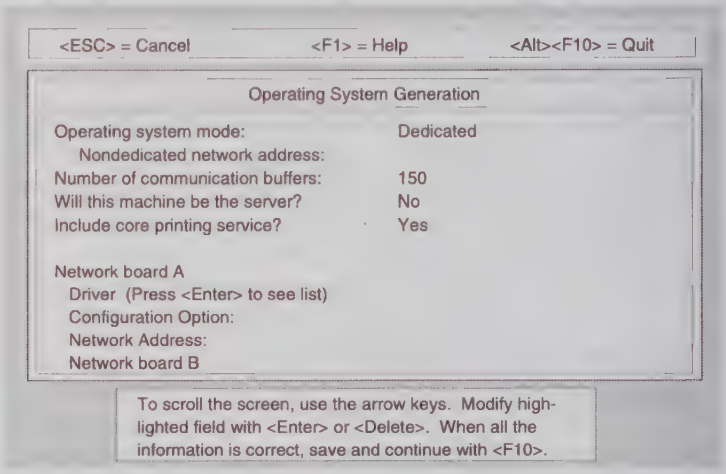

<ESC> = Cancel
<F1> = Help
<Alt><F10> = Quit
Operating System Generation
Operating system mode: Dedicated
Nondedicated network address:
Number of communication buffers: 150
Will this machine be the server? No
Include core printing service? Yes
Network board A
Driver (Press <Enter> to see list)
Configuration Option:
Network Address:
Network board B
To scroll the screen, use the arrow keys. Modify highlighted field with <Enter> or <Delete>. When all the information is correct, save and continue with <F10>.

Figure 4-5. Operating System Generation

The operating system mode, communication buffers, network cards, and other parameters are selected from this **Operating System Generation** screen. Only the installation of the Adaptec driver is described here.

3 Use the down arrow key to view the available channels. The screen should look similar to:

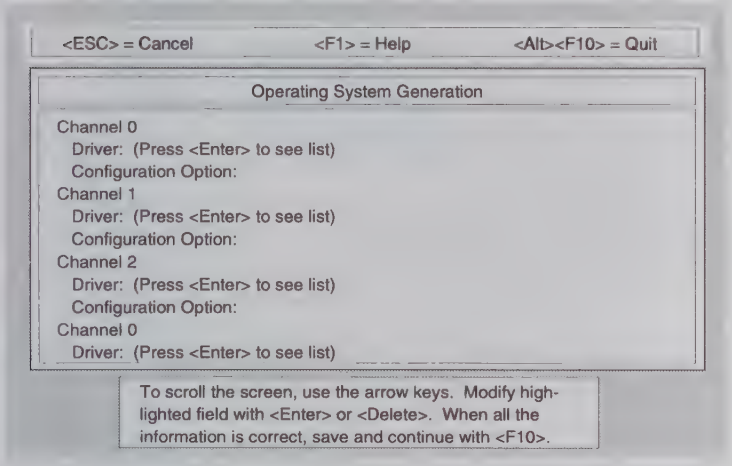


Figure 4-6. Available Channels

In general, you should use the lowest numbered available channel.

4 Select **Driver** (Press **Enter** to see list). The screen will display all available drivers, including the Adaptec driver copied into the *dsk_drv_.209* subdirectory. Select the Adaptec driver:

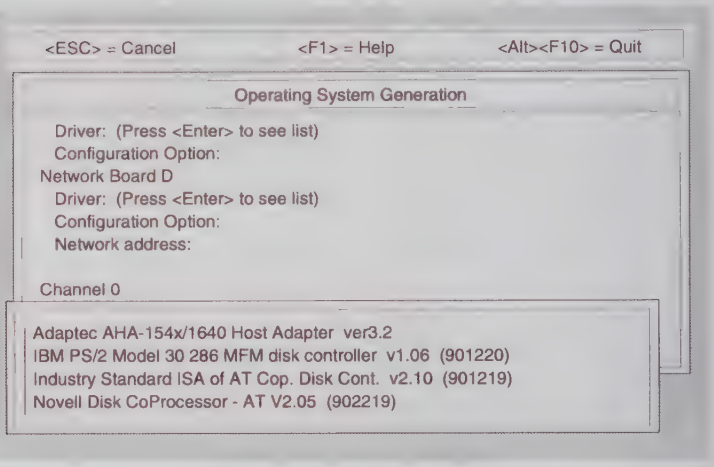

<ESC> = Cancel
<F1> = Help
<Alt><F10> = Quit
Operating System Generation
Driver: (Press <Enter> to see list)
Configuration Option:
Network Board D
Driver: (Press <Enter> to see list)
Configuration Option:
Network address:
Channel 0
Adaptec AHA-154x/1640 Host Adapter ver3.2
IBM PS/2 Model 30 286 MFM disk controller v1.06 (901220)
Industry Standard ISA of AT Cop. Disk Cont. v2.10 (901219)
Novell Disk CoProcessor - AT V2.05 (902219)

Figure 4-7. List of Drivers

5 Select **Configuration Option** to configure the driver. The configuration options will be displayed, as shown below:

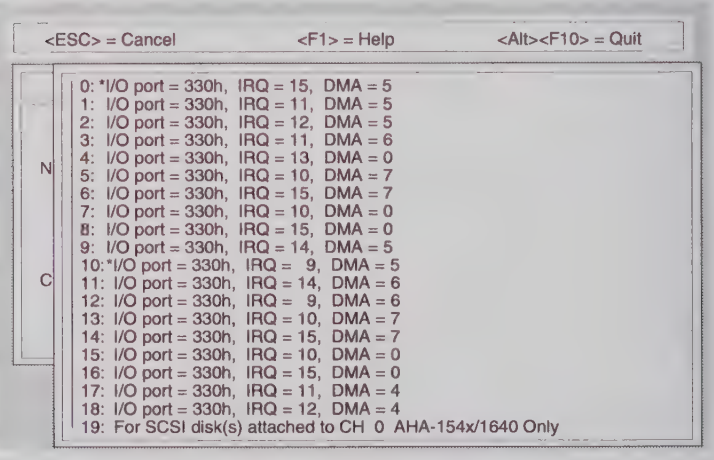

<ESC> = Cancel
<F1> = Help
<Alt><F10> = Quit
0: *I/O port = 330h, IRQ = 15, DMA = 5
1: I/O port = 330h, IRQ = 11, DMA = 5
2: I/O port = 330h, IRQ = 12, DMA = 5
3: I/O port = 330h, IRQ = 11, DMA = 6
4: I/O port = 330h, IRQ = 13, DMA = 0
5: I/O port = 330h, IRQ = 10, DMA = 7
6: I/O port = 330h, IRQ = 15, DMA = 7
7: I/O port = 330h, IRQ = 10, DMA = 0
8: I/O port = 330h, IRQ = 15, DMA = 0
9: I/O port = 330h, IRQ = 14, DMA = 5
10: *I/O port = 330h, IRQ = 9, DMA = 5
11: I/O port = 330h, IRQ = 14, DMA = 6
12: I/O port = 330h, IRQ = 9, DMA = 6
13: I/O port = 330h, IRQ = 10, DMA = 7
14: I/O port = 330h, IRQ = 15, DMA = 7
15: I/O port = 330h, IRQ = 10, DMA = 0
16: I/O port = 330h, IRQ = 15, DMA = 0
17: I/O port = 330h, IRQ = 11, DMA = 4
18: I/O port = 330h, IRQ = 12, DMA = 4
19: For SCSI disk(s) attached to CH 0 AHA-154x/1640 Only

Figure 4-8. Configuration Options

6 After you have selected the proper configuration option and have made all desired entries in the **Operating System Generation** screen, press **F10**. The **Ztest** screen will appear.

This test checks track zero of the disk drives being installed in the file server. The test will destroy any data on the hard disks selected. NetWare-Ready drives have been tested and are ready for use without running *Ztest*. The Adaptec NetWare 286 driver fully supports NetWare-Ready drives.

7 After the drives have been tested, press **F10** to display the **File Server Definition** screen. From this screen, file server parameters are selected, such as file server name, maximum open files, and other options. Select these options, as desired.

8 By default, the entire hard disk capacity is assigned the NetWare volume. Use the down arrow key to display the hard disk information. The screen should look similar to:

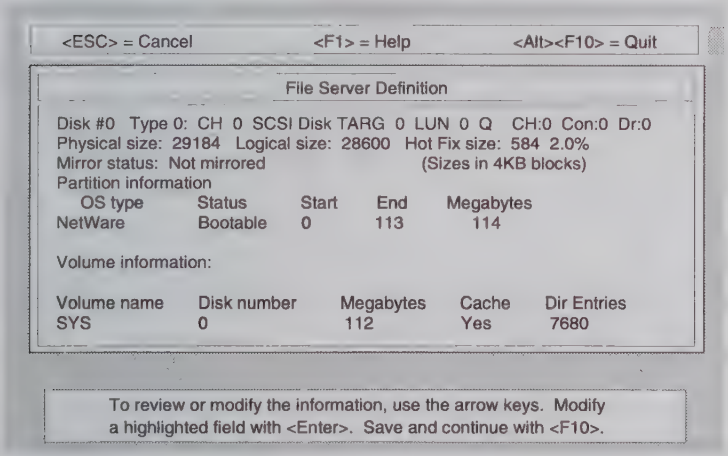

<ESC> = Cancel
<F1> = Help
<Alt><F10> = Quit
File Server Definition
Disk #0 Type 0: CH 0 SCSI Disk TARG 0 LUN 0 Q CH:0 Con:0 Dr:0
Physical size: 29184 Logical size: 28600 Hot Fix size: 584 2.0%
Mirror status: Not mirrored
(Sizes in 4KB blocks)
Partition information
OS type Status Start End Megabytes
NetWare Bootable 0 113 114
Volume information:
Volume name Disk number Megabytes Cache Dir Entries
SYS 0 112 Yes 7680
To review or modify the information, use the arrow keys. Modify a highlighted field with <Enter>. Save and continue with <F10>.

Figure 4-9. Hard Disk Information

If the parameters are correct, press **F10**. The NetWare files and Cold Boot Loader will be copied to the SCSI hard disk. Installation is now complete. Boot to the SCSI hard disk to start the file server.

Mirroring and Duplexing

The NetWare procedure for installing a mirrored/duplexed pair of disk drives is similar to the Standard installation procedure. Mirroring/duplexing is enabled or disabled from the **File Server Definition** screen. All disk drives that are to be mirrored/duplexed must have the same volume size. If one drive has a greater capacity than the other, not all the capacity of the larger drive will be used, to match the smaller drive. Since the volume sizes are now equal, the drives can be mirrored/duplexed.

Use the down arrow key to display the hard disk information. The current Mirror status should be Not mirrored.

Select **Not mirrored**. The screen should look similar to:

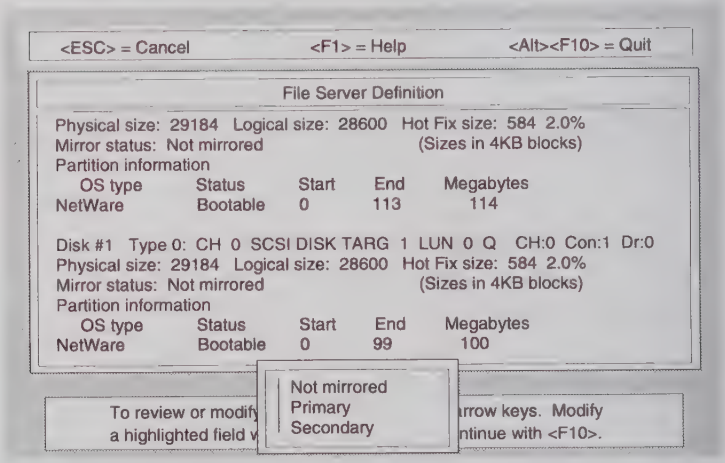

<ESC> = Cancel
<F1> = Help
<Alt><F10> = Quit
File Server Definition
Physical size: 29184 Logical size: 28600 Hot Fix size: 584 2.0%
Mirror status: Not mirrored
(Sizes in 4KB blocks)
Partition information
OS type Status Start End Megabytes
NetWare Bootable 0 113 114
Disk #1 Type 0: CH 0 SCSI DISK TARG 1 LUN 0 Q CH:0 Con:1 Dr:0
Physical size: 29184 Logical size: 28600 Hot Fix size: 584 2.0%
Mirror status: Not mirrored
(Sizes in 4KB blocks)
Partition information
OS type Status Start End Megabytes
NetWare Bootable 0 99 100
Not mirrored
Primary
Secondary
To review or modify
a highlighted field v
rrow keys. Modify
ntinue with <F10>.

Figure 4-10. Setup for Mirroring/Duplexing

Select **Primary**. An additional menu will appear, called **Mirrored with Disk #**. Enter the number of the disk drive to be mirrored/duplexed. When all drives are mirrored/duplexed or not mirrored/duplexed as desired, press the **F10** key. NetWare will be installed onto the disk drive(s), and installation is complete.

Multiple Channels - Multitasking

When a host adapter has more than one disk drive connected, a performance increase can be realized by assigning each drive to its own channel. This allows for multitasking on the SCSI bus (because NetWare 286 can only do one I/O per channel at a time).

The NetWare procedure for assigning multiple channels per host adapter is similar to the standard installation. The only difference is in the Operating System Generation section of the installation. The host adapter driver should be loaded once for each hard disk drive to map those disk drives to a channel. Not all the hard disk drives on the SCSI bus need to be assigned a channel (e.g., some drives on the host adapter may be assigned a separate channel, others may not be). When the disk drive that is installed to another channel is configured, only options 19-23 or 43-47 should be used, depending on the channel used to configure the host adapter.

Installing NetWare 286 v2.15

netgen.exe is the NetWare program used to create a file server with NetWare 286 v2.15. Described below are several methods of installing NetWare. See the *Novell NetWare User's Manual* for complete installation instructions.

There are four *netgen* Run Options:

- Standard (floppy disks)
- RAM Disk
- Hard Disk
- Network Drive

The Standard option involves installing NetWare from the Novell-supplied diskettes. The RAM Disk, Hard Disk, and Network Drive option involves copying the files from the NetWare diskettes into the appropriate subdirectories. The subdirectory name should match the name of the diskette. The Hard Disk option is described on page 4-16.

If you use the Standard option from floppy disks, you will be prompted when to insert the diskette with the Adaptec driver when you are running *netgen*. Use the **Load and Select Item** option under the **Select Disk Drivers** menu to load the driver. Copy the desired

driver (v3.1 or v3.2) from its subdirectory on the Adaptec diskette to the root directory of a diskette. The volume label of that diskette should be *dsk_drv_209*.

If you use the RAM Disk, Hard Disk, or Network Drive option, create a subdirectory on the RAM Disk, Hard Disk, or Network Drive named *dsk_drv_.209*. Copy the files from the Adaptec diskette to that subdirectory. Use either v3.1 or v3.2 of the Adaptec NetWare 286 drivers, as desired. Use the **Load and Select Item** option under the **Select Disk Drivers** menu to load the Adaptec driver.

Hard Disk Installation Option

Here is the recommended step-by-step installation process using the Hard Disk option (the Network Drive option is similar). Other installation options are described in the *NetWare Installation Manual*.

1 Enter netgen -n at the DOS prompt. The screen should look similar to:

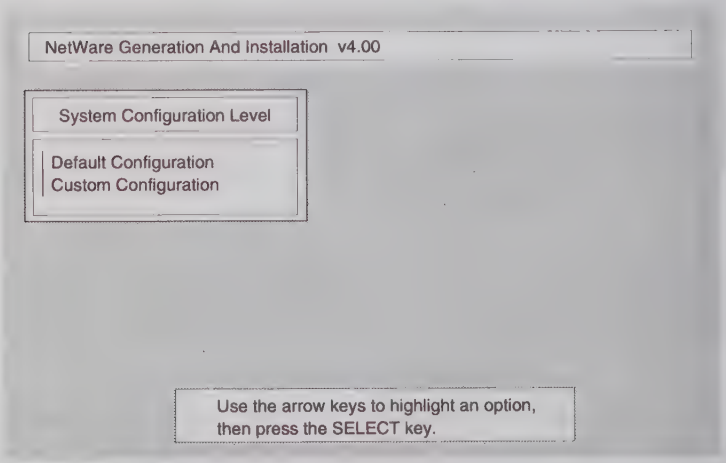

NetWare Generation And Installation v4.00
System Configuration Level
Default Configuration
Custom Configuration
Use the arrow keys to highlight an option,
then press the SELECT key.

Figure 4-11. System Configuration Menu

2 Select **Custom Configuration**. The screen should look similar to:

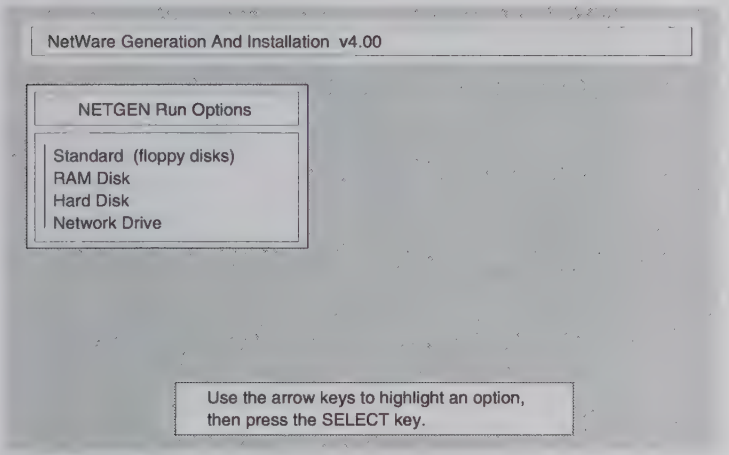


Figure 4-12. NETGEN Run Options

3 Select **Hard Disk**. You will be prompted for the logical drive letter that contains the NetWare subdirectories previously created. The screen should look similar to:

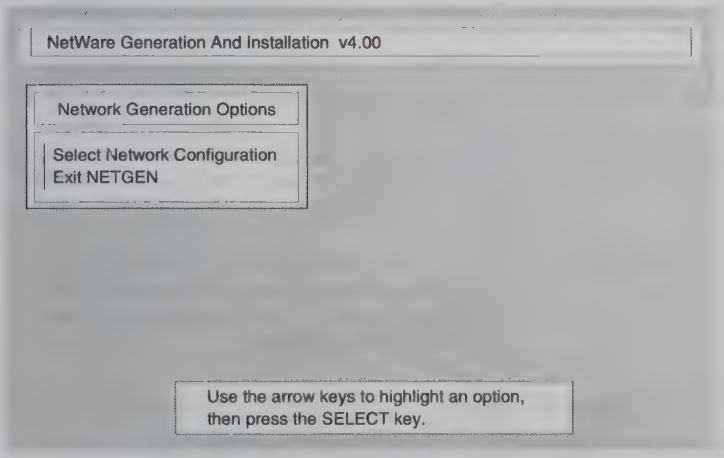

NetWare Generation And Installation v4.00
Network Generation Options
Select Network Configuration
Exit NETGEN
Use the arrow keys to highlight an option,
then press the SELECT key.

Figure 4-13. Network Generation Options

4 Select **Select Network Configuration**. This list of available options will appear:

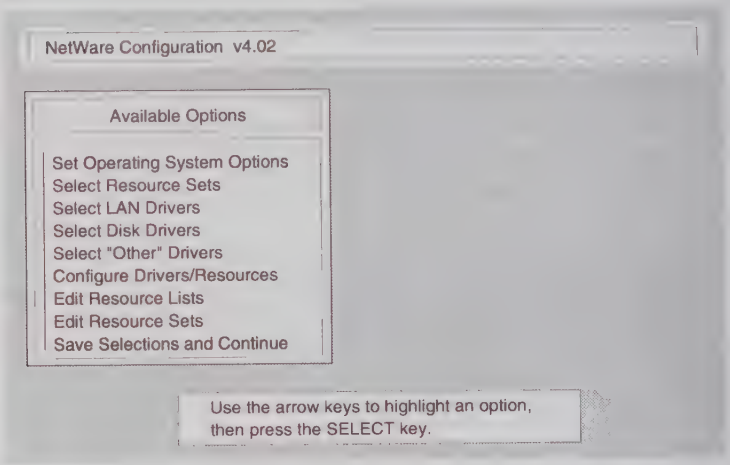


Figure 4-14. Network Configuration Options

In general, you should select at least the following options:

Options	Purpose
Set Operating System Options	This option is used to set the mode of operation of NetWare 286. Consult the *NetWare Installation Manual* for the appropriate selection.
Select LAN Drivers	This option is used to select the type(s) of LAN card(s) to be installed into the file server.
Select Disk Drivers	This option is used to select the type of controllers and host adapters that will be installed into the file server. This is the option that is selected to install the Adaptec NetWare 286 drivers.
Configure Drivers / Resources	This option is used to configure the LAN drivers, disk drivers, and any other drivers that were previously selected. This option will only appear if a driver has been previously selected (e.g., LAN drivers or disk drivers).

Consult your *NetWare User's Manual* for information on Set Operating System Options and Select LAN Drivers.

5 Select **Select Disk Drivers**. The screen should look similar to:

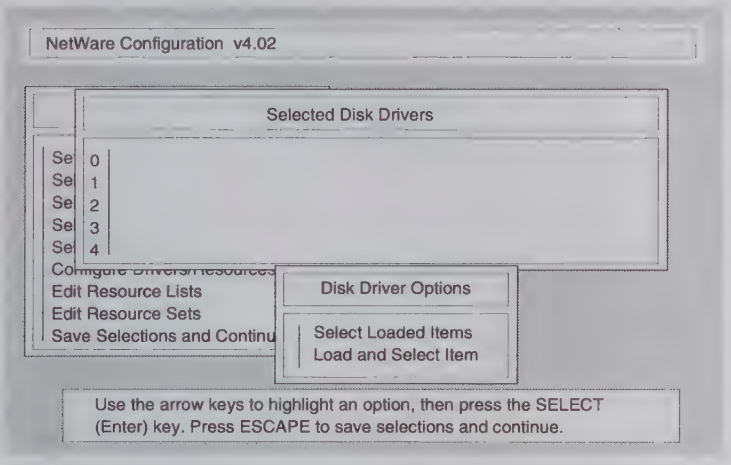


Figure 4-15. Disk Driver Options

Five channels are available for installing disk drivers. The two Disk Driver Options are:

- Select Loaded Item
- Load and Select Item

6 Select **Load and Select Item**. The Adaptec NetWare drivers will be read from all *dsk_drv_.xxx* subdirectories including the *dsk_drv_.209* subdirectory, which you created at the beginning of the installation.

The screen should look similar to:

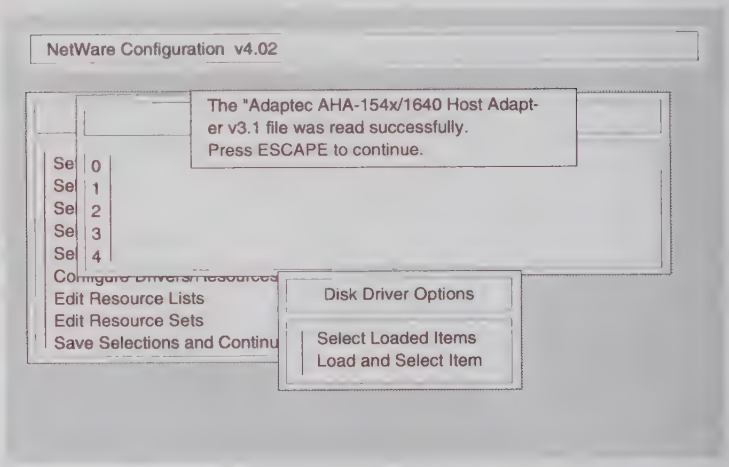


Figure 4-16. Loading the Adaptec Driver

You will then be prompted for a channel number. Valid channel numbers are between 0 and 4. A list of available disk drivers will be displayed:

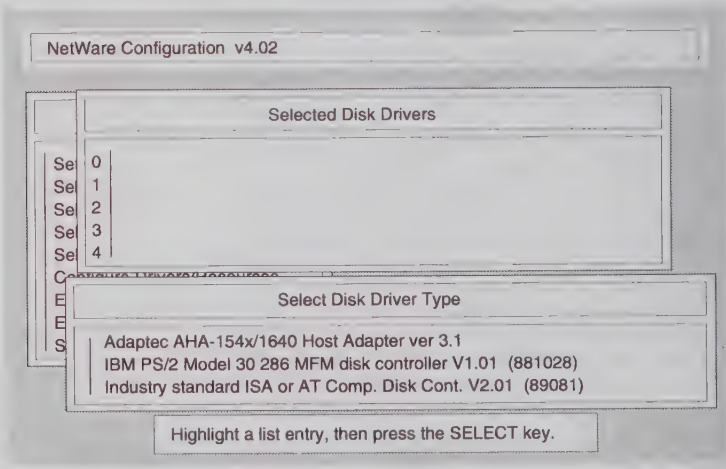

NetWare Configuration v4.02
Selected Disk Drivers
0
1
2
3
4
Select Disk Driver Type
Adaptec AHA-154x/1640 Host Adapter ver 3.1
IBM PS/2 Model 30 286 MFM disk controller V1.01 (881028)
Industry standard ISA or AT Comp. Disk Cont. V2.01 (89081)
Highlight a list entry, then press the SELECT key.

Figure 4-17. Select Disk Driver Type

7 After you select all of the desired drivers, select **Configure Drivers / Resources** from the **Available Options** menu. The screen should look similar to:

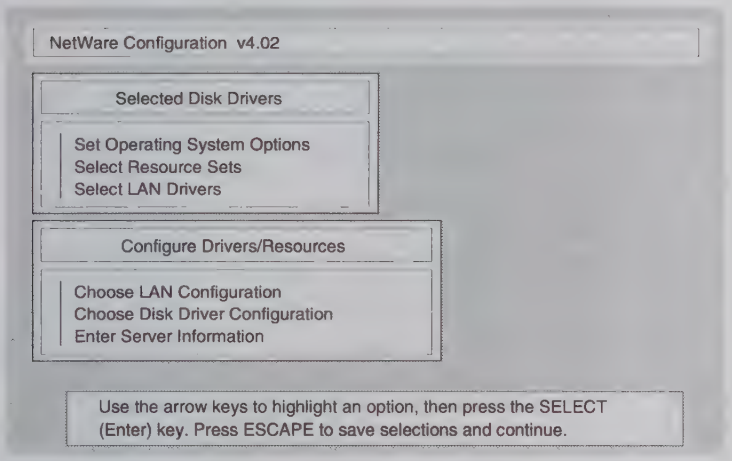

NetWare Configuration v4.02
Selected Disk Drivers
Set Operating System Options
Select Resource Sets
Select LAN Drivers
Configure Drivers/Resources
Choose LAN Configuration
Choose Disk Driver Configuration
Enter Server Information
Use the arrow keys to highlight an option, then press the SELECT (Enter) key. Press ESCAPE to save selections and continue.

Figure 4-18. Configure Drivers/Resources

Choose Disk Driver Configuration is the only option described here. See the *NetWare Installation Manual* for information on the other options.

8 Select **Choose Disk Driver Configuration**. All unconfigured disk drivers will be displayed. Select the unconfigured Adaptec driver. The screen should look similar to:

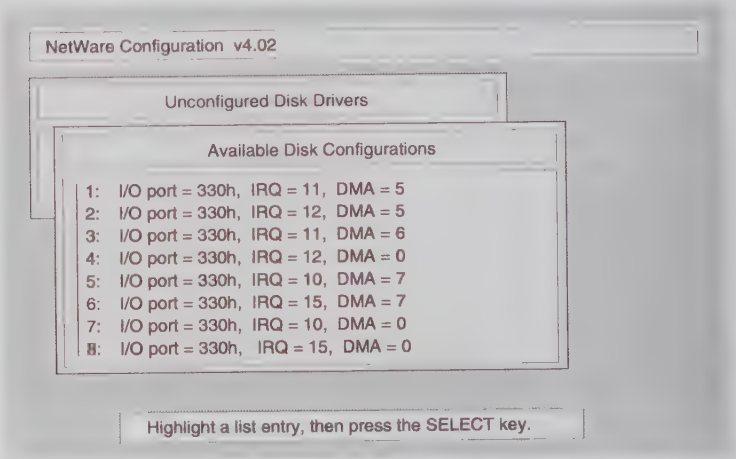

NetWare Configuration v4.02
Unconfigured Disk Drivers
Available Disk Configurations
1: I/O port = 330h, IRQ = 11, DMA = 5
2: I/O port = 330h, IRQ = 12, DMA = 5
3: I/O port = 330h, IRQ = 11, DMA = 6
4: I/O port = 330h, IRQ = 12, DMA = 0
5: I/O port = 330h, IRQ = 10, DMA = 7
6: I/O port = 330h, IRQ = 15, DMA = 7
7: I/O port = 330h, IRQ = 10, DMA = 0
8: I/O port = 330h, IRQ = 15, DMA = 0
Highlight a list entry, then press the SELECT key.

Figure 4-19. Available Disk Configurations

Note: This is only a partial list of options. Use the arrow keys to scroll down the complete list on your screen.

9 Select the option that corresponds to the host adapter settings.

10 After the driver is configured, press **Esc** to return to the main menu. Choose **Save Selections and Continue** to complete the NetWare installation. To finish the installation, refer to the *NetWare Installation Manual* on how to Link/Configure NetWare Operating System, Link/Configure File Server Utilities, and NetWare Installation.

Note: Except for the 1540C/1542C host adapters, the host adapter BIOS only operates at port address 330h. If you use an alternate address, the BIOS should be disabled, and your system will not be able to boot from any SCSI hard disk on that host adapter.

Multiple Disk Drives

Adaptec's NetWare 286 drivers support the installation of multiple SCSI hard disk drives in the file server. You might want to use multiple hard disks to:

- Support disk mirroring (fault tolerance)
- Support disk duplexing (fault tolerance)
- Take advantage of the multitasking capability of the host adapter (performance)
- Increase the system's total storage capacity (efficiency)

> **Note:** Disk mirroring and disk duplexing are only supported on SFT versions of NetWare.

Mirroring

The NetWare procedure for installing a mirrored pair of disk drives is similar to the Standard installation procedure. The only difference is in the NetWare Installation section of the installation. This step follows the step in which the NetWare Operating System and the File Server Utilities are linked and configured.

1 Select **NetWare Installation**. The screen should look similar to:

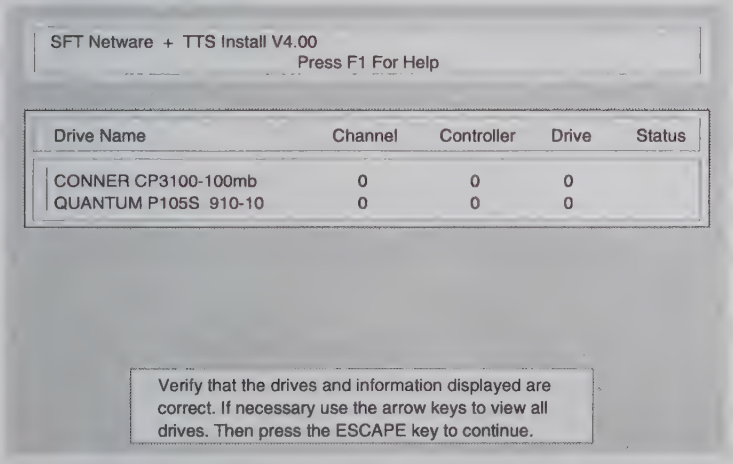


Figure 4-20. NetWare Installation Screen

Drive Nameinquiry data from the SCSI disk drive

ChannelNetWare channel to which the drive was assigned

Controllerdisk drive SCSI ID

DriveLogical Unit Number (LUN) of the controller

Statusprovides information when drives are mirrored or duplexed

The drives listed should match the drives that are installed on the AHA-1540/1542/1640.

2 Verify that the drives listed match the actual drives installed and press **Esc.** The screen should look similar to:

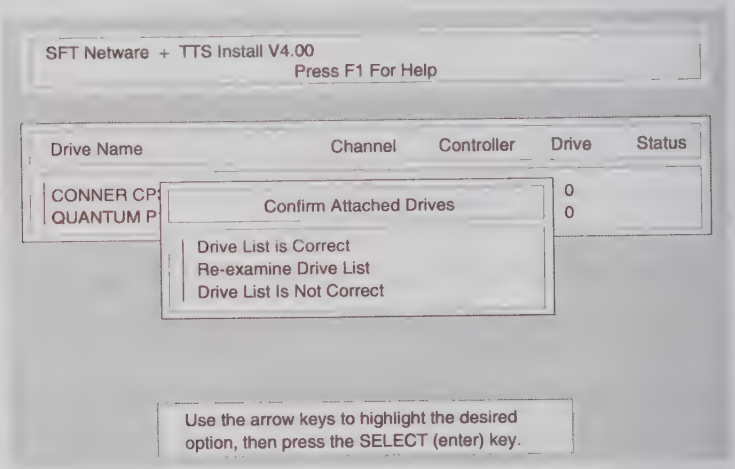


Figure 4-21. Confirm Attached Drives

3 Select **Drive List is Correct** to continue. The screen should look similar to:

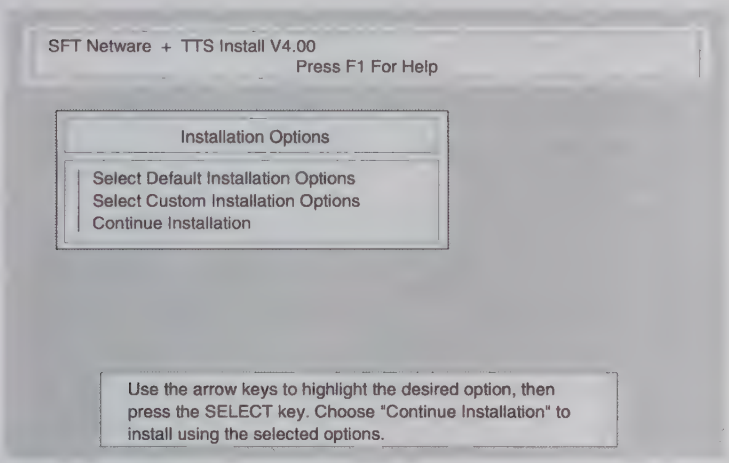

SFT Netware + TTS Install V4.00
Press F1 For Help
Installation Options
Select Default Installation Options
Select Custom Installation Options
Continue Installation
Use the arrow keys to highlight the desired option, then press the SELECT key. Choose "Continue Installation" to install using the selected options.

Figure 4-22. Installation Options

4 Select **Select Default Installation Options**. The screen will display mirroring options. By default, the drives will not be mirrored. The screen should look similar to:

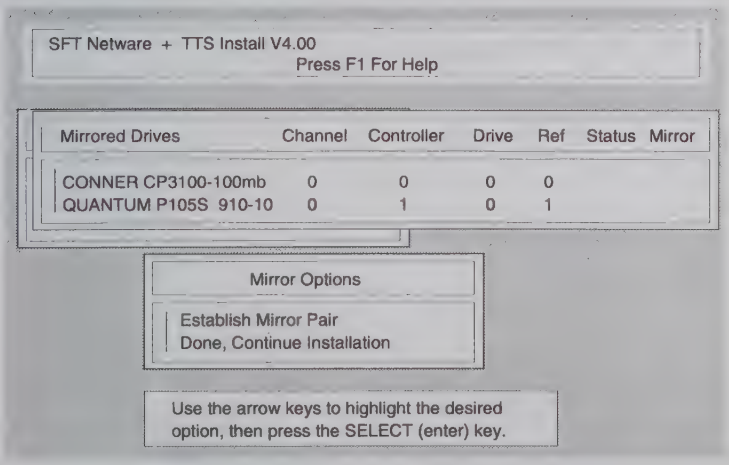


Figure 4-23. Mirror Options

5 To mirror them select **Establish Mirror Pair**. The screen should look similar to:

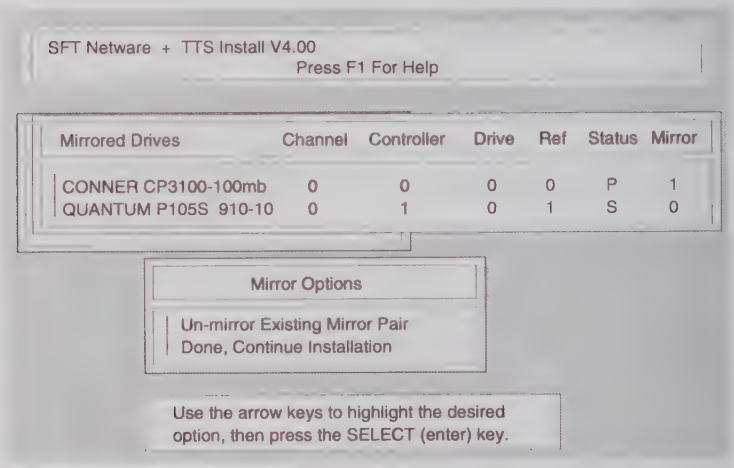


Figure 4-24. Setting Up Mirroring

To un-mirror the drives, select **Un-mirror Existing Mirror Pair**.

6 When mirroring is enabled or disabled, as desired, select **Done, Continue Installation** to continue. Follow the *NetWare Installation Manual* for naming the file server, installing the files, and other instructions.

Duplexing

The procedure for duplexing requires that the NetWare 286 driver be loaded twice. This is done in the **Select Disk Drivers** menu. Follow the procedure under Standard installation to load the driver.

1 If the following message screen appears, go to the **Configure Drivers/Resources** menu and configure any drivers. Then return to the **Select Disk Drivers** menu and load the NetWare 286 driver into channel 1.

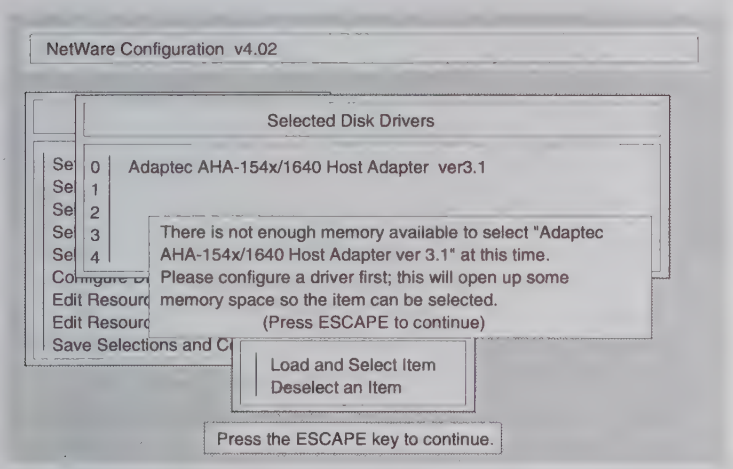

NetWare Configuration v4.02
Selected Disk Drivers
0 Adaptec AHA-154x/1640 Host Adapter ver3.1
1
2
3
4
There is not enough memory available to select "Adaptec AHA-154x/1640 Host Adapter ver 3.1" at this time.
Please configure a driver first; this will open up some memory space so the item can be selected.
(Press ESCAPE to continue)
Edit Resourc
Edit Resourc
Save Selections and C
Load and Select Item
Deselect an Item
Press the ESCAPE key to continue.

Figure 4-25. Error Message Screen

After both drivers are successfully selected, the screen should look similar to:

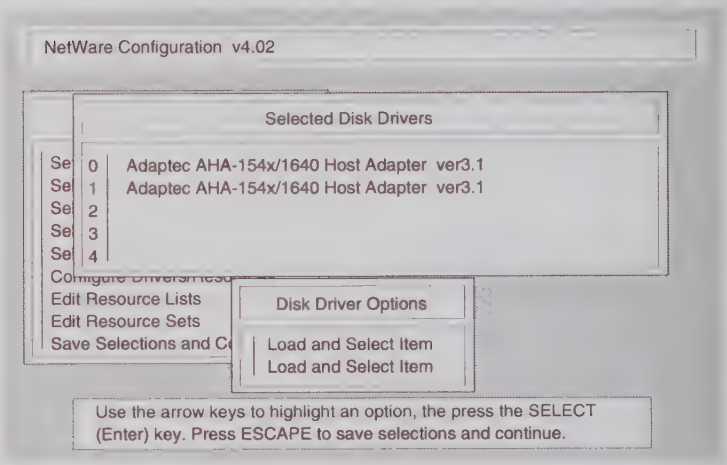

NetWare Configuration v4.02
Selected Disk Drivers
0 Adaptec AHA-154x/1640 Host Adapter ver3.1
1 Adaptec AHA-154x/1640 Host Adapter ver3.1
2
3
4
Edit Resource Lists
Edit Resource Sets
Disk Driver Options
Load and Select Item
Load and Select Item
Use the arrow keys to highlight an option, the press the SELECT
(Enter) key. Press ESCAPE to save selections and continue.

Figure 4-26. Drivers Successfully Selected

2 Configure the NetWare 286 driver with the option that corresponds to the host adapter settings.

When the NetWare 286 driver at channel 1 is configured from the **Configure Drivers/Resources** menu, only a subset of the total number of configurations will be displayed. NetWare will not display any configuration that will conflict with the driver at channel 0. Select the configuration that matches the host adapter settings.

3 Select **Save Selections and Continue**. After linking and configuring the NetWare Operating System and File Server Utilities, select **NetWare installation**. (Refer to the *NetWare Installation Manual* for information on running *compsurf*, which is located in the **Analyze Disk Surface** option.)

The screen should look similar to:

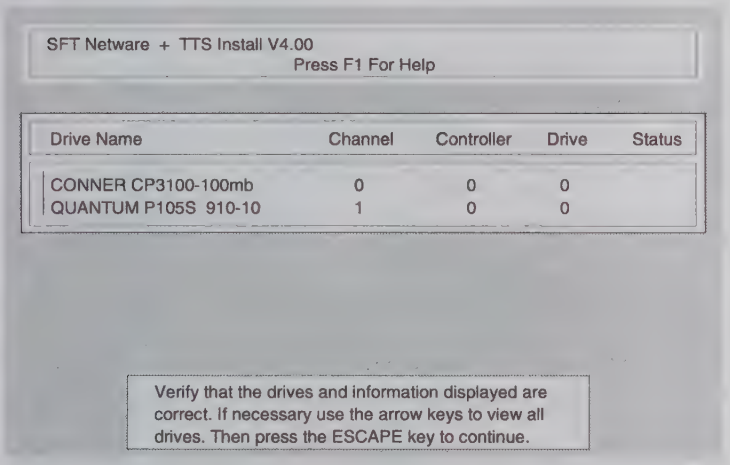

SFT Netware + TTS Install V4.00
Press F1 For Help
Drive Name
Channel
Controller
Drive
Status
CONNER CP3100-100mb 0 0 0
QUANTUM P105S 910-10 1 0 0
Verify that the drives and information displayed are correct. If necessary use the arrow keys to view all drives. Then press the ESCAPE key to continue.

Figure 4-27. Disk Drive Information

The drives listed should match the drives that are installed on the host adapter.

4 Verify that the drives listed match the actual drives installed and press **Esc**. The screen should look similar to:

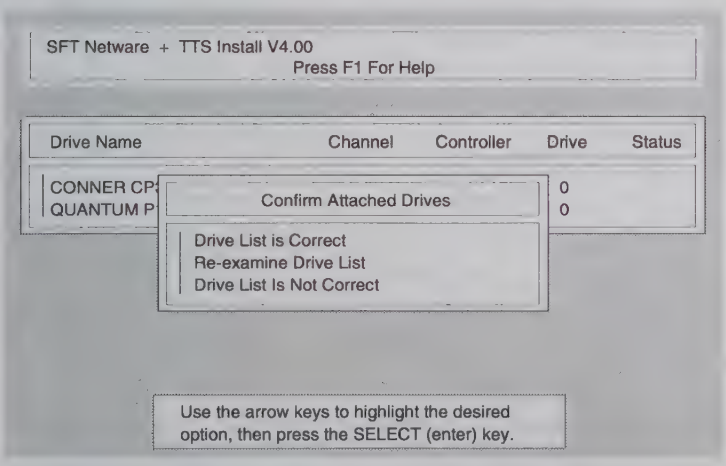


Figure 4-28. Confirm Attached Drives

5 Select **Drive List is Correct** to continue. The screen should look similar to:

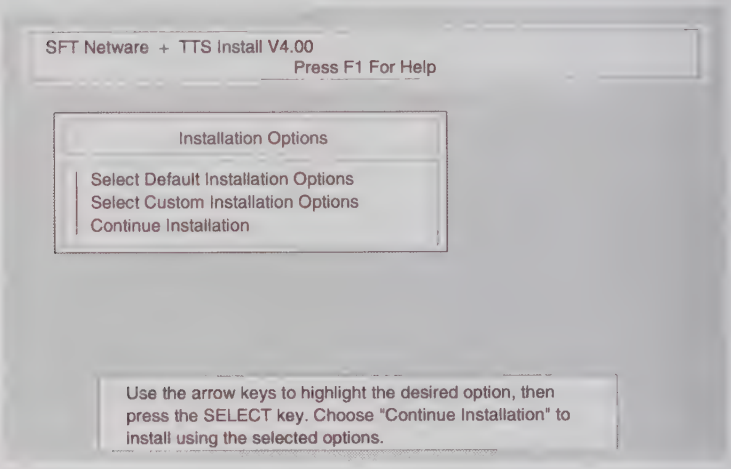

SFT Netware + TTS Install V4.00
Press F1 For Help
Installation Options
Select Default Installation Options
Select Custom Installation Options
Continue Installation
Use the arrow keys to highlight the desired option, then press the SELECT key. Choose "Continue Installation" to install using the selected options.

Figure 4-29. Installation Options

6 Choose **Select Default Installation Options**. The screen will display mirroring options. By default the drives will not be duplexed (mirrored). The screen should look similar to:

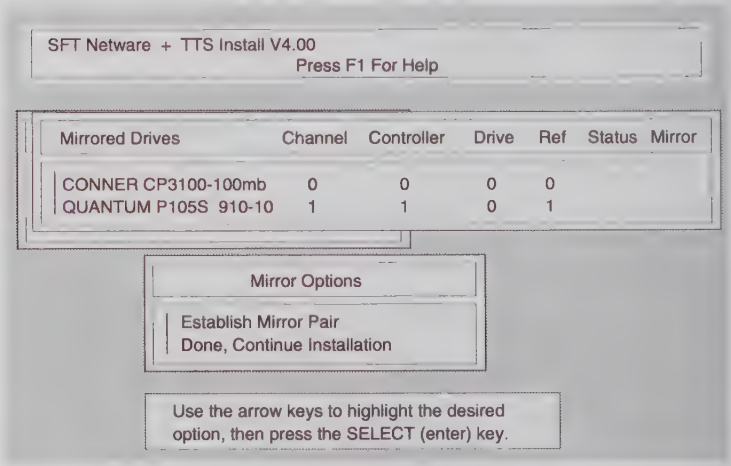


Figure 4-30. Mirror Options

7 To duplex the drives select **Establish Mirror Pair**. The screen should look similar to:

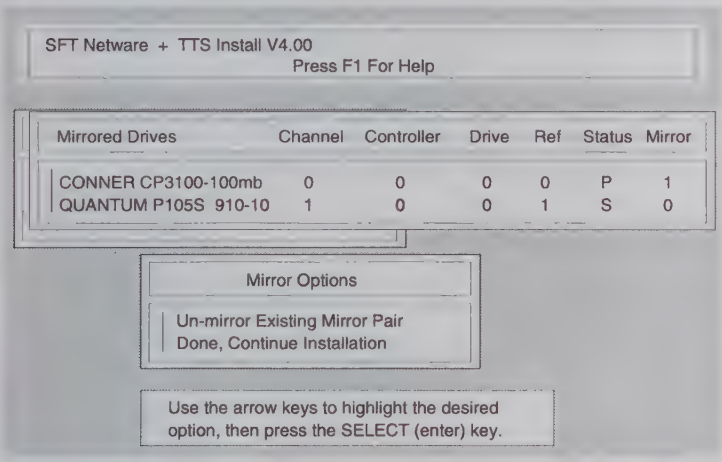


Figure 4-31. Duplexing the Drives

To unduplex the drives, select **Un-mirror Existing Mirror Pair**. When duplexing is enabled or disabled, as desired, select **Done, Continue Installation** to continue. Follow the *NetWare Installation Manual* for naming the file server, installing the files, and other instructions.

Multiple Channels - Multitasking

The NetWare procedure for assigning multiple channels per host adapter is similar to the Standard installation. The only difference is in the *Select Disk Drivers* section of the installation. The Adaptec driver should be loaded once for each hard disk drive to map those disk drives to a channel. Not all the hard disk drives on the SCSI bus need to be assigned a channel (e.g., some drives on the host adapter may be assigned a separate channel, others may not be).

When the driver is loaded twice, the screen in the Select Disk Drivers section should look similar to:

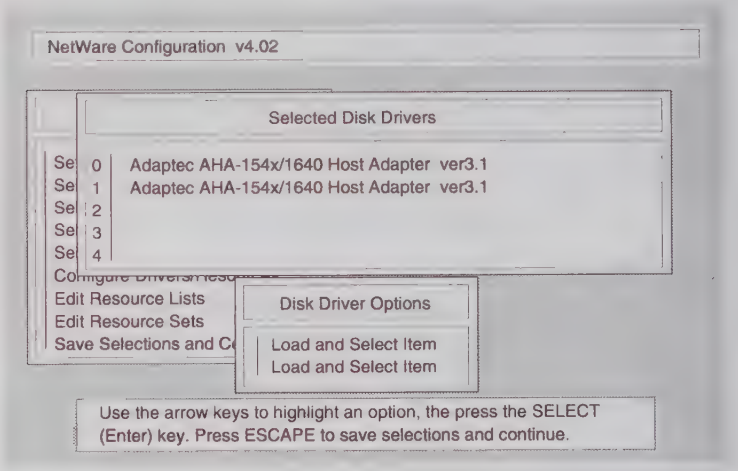

NetWare Configuration v4.02
Selected Disk Drivers
0 Adaptec AHA-154x/1640 Host Adapter ver3.1
1 Adaptec AHA-154x/1640 Host Adapter ver3.1
2
3
4
Edit Resource Lists
Edit Resource Sets
Disk Driver Options
Load and Select Item
Load and Select Item
Use the arrow keys to highlight an option, the press the SELECT (Enter) key. Press ESCAPE to save selections and continue.

Figure 4-32. Selected Disk Drivers

1 Configure the driver at channel 0 to the correct I/O port, DMA channel, and interrupt channel.

When you configure the driver at channel 1, only a subset of the configuration options appears. Use the down arrow key to scroll to options 19 through 31. The screen should look similar to:

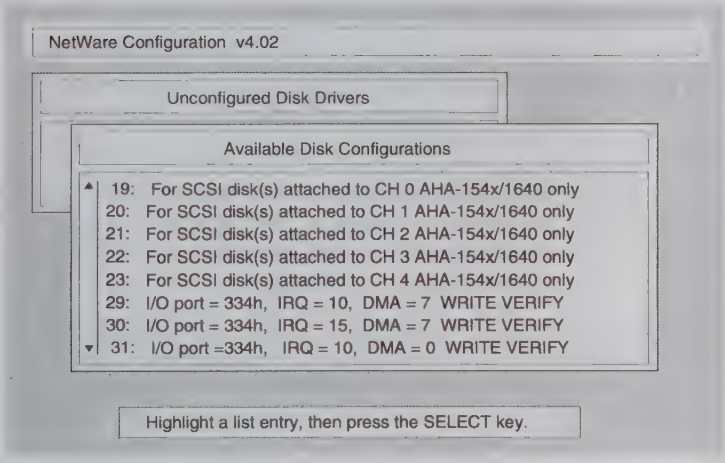

NetWare Configuration v4.02
Unconfigured Disk Drivers
Available Disk Configurations
19: For SCSI disk(s) attached to CH 0 AHA-154x/1640 only
20: For SCSI disk(s) attached to CH 1 AHA-154x/1640 only
21: For SCSI disk(s) attached to CH 2 AHA-154x/1640 only
22: For SCSI disk(s) attached to CH 3 AHA-154x/1640 only
23: For SCSI disk(s) attached to CH 4 AHA-154x/1640 only
29: I/O port = 334h, IRQ = 10, DMA = 7 WRITE VERIFY
30: I/O port = 334h, IRQ = 15, DMA = 7 WRITE VERIFY
31: I/O port =334h, IRQ = 10, DMA = 0 WRITE VERIFY
Highlight a list entry, then press the SELECT key.

Figure 4-33. Available Disk Configurations

2 Select the option that corresponds to the channel that was used to configure the correct DMA channel and interrupt channel.

In this case, option **19**: **For SCSI disk(s) attached to CH 0 AHA-154x/1640 only** would be chosen, since channel 0 was used to configure the DMA channel and interrupt channel for the host adapter.

After configuring all of the drivers in the **Configure Drivers/ Resources** menu, the current configuration can be viewed. The screen should look similar to:

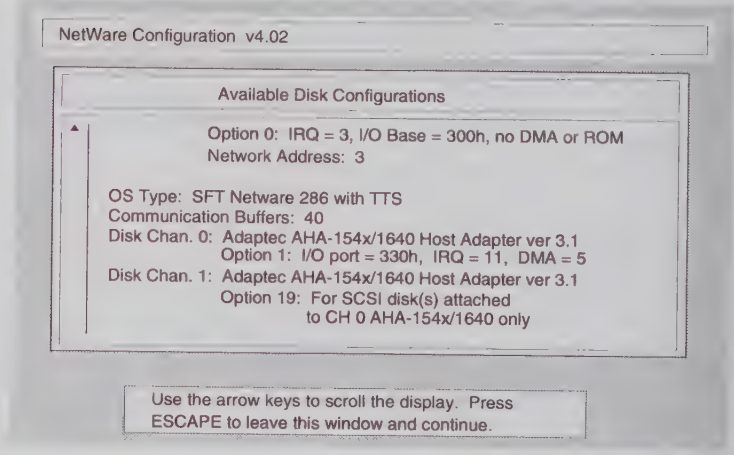

NetWare Configuration v4.02
Available Disk Configurations
Option 0: IRQ = 3, I/O Base = 300h, no DMA or ROM
Network Address: 3
OS Type: SFT Netware 286 with TTS
Communication Buffers: 40
Disk Chan. 0: Adaptec AHA-154x/1640 Host Adapter ver 3.1
Option 1: I/O port = 330h, IRQ = 11, DMA = 5
Disk Chan. 1: Adaptec AHA-154x/1640 Host Adapter ver 3.1
Option 19: For SCSI disk(s) attached
to CH 0 AHA-154x/1640 only
Use the arrow keys to scroll the display. Press
ESCAPE to leave this window and continue.

Figure 4-34. Viewing the Configuration

3 After the driver is configured, press **Esc** to return to the main menu. Choose **Save Selections and Continue** to complete the NetWare installation.

To finish the installation from this point, consult the *NetWare Installation Manual* on how to Link/Configure NetWare Operating System, Link/Configure File Server Utilities, and NetWare Installation.

Commonly Asked Questions on NetWare 286

Do I need the Adaptec NetWare driver if I am using my host adapter in a Novell NetWare workstation?

No, the driver is only required if the host adapter is to be used in a *file server.* It is not required when using the host adapter in a workstation.

Do the NetWare drivers on the ASW-1400 and the ASW-1440 also work with Adaptec's single user AHA-1520/1522 host adapter?

No. Adaptec's AHA-1520/1522 has its own driver, the ASW-1240.

Are Adaptec's NetWare drivers certified by Novell?

Adaptec's drivers for NetWare 286 v2.15, NetWare 286 v2.2, NetWare 386 v3.11 and NetWare 386 v4.0 are fully Novell certified drivers.

Can I run a SCSI tape backup device attached to my host adapter with the ASW-210 Sytos or the ASW-310 Sytos Plus® tape package while my system is configured as a file server in Novell NetWare?

No, you cannot. The ASW-210 and ASW-310 only support tape backup on DOS workstations, not on file servers.

Is it important which channel the host adapter is assigned to?

In general, the host adapter that is used to boot should be assigned to channel 0.

If a host adapter is installed along with a standard MFM/RLL/ESDI controller, the following guidelines should be used:

- Boot from the standard disk
- Disable the host adapter BIOS
- Assign the standard disk driver to channel 0
- Assign the host adapter driver to channel 1, 2, 3 or 4

What is the Write Verify configuration option?

Each configuration option (I/O base address/IRQ/DMA) can be configured to Write or Write Verify. For example, for a host adapter at port 330h, IRQ 11, and DMA channel 5, option 1 should be used for Write only or option 25 should be used for Write Verify. Standard Write will use the SCSI write command when writing data to the hard disk. Write verify will use the SCSI write and verify command when writing to the disk drive. If the SCSI write and verify command

is not supported by a particular drive, then the SCSI write command followed by the SCSI verify command will be used.

The Write Verify option will decrease overall system performance, but offers a higher degree of reliability. In general the Write only option is usually sufficient.

Will my AHA-1540/1542 work in every AT-compatible system?

The AHA-1540/1542 is a Bus Master DMA device, and requires that the host system support Bus Master DMA. If a particular host system does not support Bus Master DMA, you cannot use an AHA-1540/1542 (or any other Bus Master board) in that system.

You can use a test that is built into the AHA-1540/1542 BIOS to determine if the host system supports Bus Master DMA. It can be invoked by using DOS *debug.com*. At the debug - prompt, enter g=dc00:9. The instruction will be printed on the screen. (This assumes your AHA-1540/1542 is configured for a BIOS address of DC000h.)

Can I use my AHA-1740/1742/1744 host adapter with Adaptec's NetWare 286 drivers?

AHA-1740/1742/1744 host adapters have two operating modes, Standard and Enhanced.

- Standard Mode emulates the AHA-1540/1542, so the NetWare 286 drivers can be used when the AHA-1740/1742/1744 is in Standard Mode.
- Enhanced Mode uses an advanced host interface and allows greater than 16 MBytes of host RAM to be accessed. Adaptec does not provide a NetWare 286 Enhanced Mode driver for the AHA-1740/1742/1744.

NetWare 286 Error Messages

Error messages in NetWare 286 drivers can only be displayed when a fatal error has occurred. Once this message is displayed, the server will *abend*. This will terminate server activity. NetWare 286 driver error messages are only displayed during installation.

The following are the possible error messages:

AHA154x/1640 Host Adapter is not idle while trying to reset interrupt.

AHA154x/1640 Can't send a byte due to Command/Data port still FULL.

AHA154x/1640 Can't get a byte due to Data port not FULL.

AHA154x/1640 configuration data contains no DMA channel.

AHA154x/1640 configuration data contains no interrupt channel.

AHA154x/1640 INQUIRY command Completed with Error or Time Out.

AHA154x/1640 Test Unit Ready command Completed with Error or Time Out.

AHA154x/1640 READ CAPACITY command Completed with Error or Time Out.

AHA154x/1640 Host Adapter Not Configured to proper IO port address.

AHA154x/1640 Host Adapter Not Configured to proper IO interrupt channel.

AHA154x/1640 Host Adapter Not Configured to proper IO DMA channel.

These errors may occur for the following reasons:

- The host adapter hardware settings do not match the configuration option selected during ***netgen***. Check the configuration of the AHA-1540/1542 or the POS setting of the AHA-1640.
- There is a hardware conflict between the host adapter and another card in the system. Check the port address, DMA channel and interrupt channel of other I/O cards in the system. Some VGA cards and some LAN cards use port address 330h, the default port address of the AHA-1540/1542/1640/1740/1742/1744.
- The SCSI bus is not properly terminated. Only the devices on the end of the SCSI bus should be terminated. The host adapter is considered a SCSI device. Its on-board termination should be

disabled only if both the internal and external SCSI connectors are used.

- There is a SCSI ID conflict on the SCSI bus. Each device on the SCSI bus should be assigned a unique SCSI ID. SCSI IDs range between 0 and 7. The default host adapter SCSI ID is 7. Check the SCSI IDs of every device on the SCSI bus to ensure that each has a unique SCSI ID.
- The host adapter is malfunctioning. One quick way to check this is to boot DOS under it. If it runs DOS, it probably is not a hardware failure.
- The drive does not work with this host adapter. Again, check this under DOS. If it works with DOS, it should work with NetWare 286.

Host Adapter Options

AHA-1540/1542

Be sure that the host adapter settings match the hardware configuration options you select.

Option	Write Verify Option	Port	IRQ	DMA
1	25	330h	11	5
2	26	330h	12	5
3	27	330h	11	6
4	28	330h	14	6
5	29	334h	10	7
6	30	334h	15	7
7	31	334h	10	0
8	32	334h	15	0
9	33	230h	14	5
10	34	230h	9	5
11	35	230h	14	6
12	36	230h	9	6
13	37	234h	10	7
14	38	234h	15	7
15	39	234h	10	0
16	40	234h	15	0
19	43	For SCSI disk(s) attached to Ch 0 AHA-1540/1542/1640 only		
20	44	For SCSI disk(s) attached to Ch 1 AHA-1540/1542/1640 only		
21	45	For SCSI disk(s) attached to Ch 2 AHA-1540/1542/1640 only		
22	46	For SCSI disk(s) attached to Ch 3 AHA-1540/1542/1640 only		
23	47	For SCSI disk(s) attached to Ch 4 AHA-1540/1542/1640 only		

AHA-1640

Be sure that the POS registers of the AHA-1640 match the hardware configuration options you select.

Option	Write Verify Option	Port	IRQ	DMA
0	24	330h	15	5
1	25	330h	11	5
2	26	330h	12	5
3	27	330h	11	6
5	29	334h	10	7
6	30	334h	15	7
9	33	230h	14	5
10	34	230h	9	5
11	35	230h	14	6
12	36	230h	9	6
13	37	234h	10	7
14	38	234h	15	7
17	41	234h	11	4
18	42	234h	12	4
19	43	For SCSI disk(s) attached to Ch 0 AHA-1540/1542/1640 only		
20	44	For SCSI disk(s) attached to Ch 1 AHA-1540/1542/1640 only		
21	45	For SCSI disk(s) attached to Ch 2 AHA-1540/1542/1640 only		
22	46	For SCSI disk(s) attached to Ch 3 AHA-1540/1542/1640 only		
23	47	For SCSI disk(s) attached to Ch 4 AHA-1540/1542/1640 only		

OS/2

Section 2

Chapter 5 OS/2 v1.3-LADDR Introduction

Chapter 6 LADDR Installation

Chapter 7 Installing Under OS/2 v2.x

5 OS/2 v1.3-LADDR Introduction

About This Chapter

Read this chapter to find out:

- General product information and multiple host adapter support
- The rules that must be followed for proper SCSI bus operation
- The structure of the files contained on the Adaptec ASW-1400 and ASW-1420 diskettes

▼▼▼▼ 5

General Product Information

LADDR is an I/O architecture that allows multiple device drivers to share SCSI host adapter hardware. LADDR makes it possible for third-party software vendors to develop SCSI software to run on any OS/2 LADDR system.

These drivers are designed to be installed under the IBM OS/2 or Microsoft OS/2 v1.3 operating system.

As stated in the *Preface*, you probably received Adaptec drivers for OS/2 on the ASW-1400 diskette included with your host adapter board. (The ASW-1400 also includes drivers for other operating environments.) Or you may have purchased a separate ASW-1420 diskette, which includes only OS/2 drivers.

> **Note:** Adaptec's drivers are embedded in Microsoft OS/2 v1.30.1. If you are using this version of OS/2 you do not need to install drivers from the ASW diskettes.

The Adaptec drivers on the ASW-1400 and ASW-1420 support the following Adaptec host adapters:

- AHA-1540/1542
- AHA-1640
- AHA-1740/1742/1744

Multiple Host Adapter Support

The host adapters listed above cannot be mixed within a system. However, multiple host adapters within the same family can be installed as follows:

Maximum Number	Host Adapter Family
4	AHA-1540/1542 AHA-1740/1742/1744 (Standard Mode)
6	AHA-1640
8	AHA-1740/1742/1744 (Enhanced Mode)

SCSI Hardware Considerations

The SCSI bus is an electrical bus and has rules that must be followed for proper operation. The SCSI cable(s) attached to a SCSI host adapter can also be referred to as the SCSI bus.

SCSI Bus Termination

The SCSI bus is like a chain, with SCSI devices on the ends of the chain and sometimes in the middle. Only the SCSI devices on the ends of the SCSI bus should be terminated. All other SCSI devices on the bus must have their termination disabled.

Some Adaptec host adapters have terminating resistors socketed in line modules that can be removed, if required. On other host adapter models you enable or disable termination by running a configuration program. Refer to the appropriate user's manual for more information on enabling or disabling termination.

Some host adapters have both internal and external SCSI connectors. If only one of these connectors is used, the host adapter is on the end of the SCSI bus, and it must be terminated. If both internal and external connectors are used, the host adapter is in the middle of the SCSI bus, and its termination must be disabled.

SCSI ID

All devices attached to a SCSI bus must have a unique SCSI ID. These values range from 0 to 7. SCSI ID 7 is normally used by the host adapter.

The Adaptec SCSI host adapter BIOS usually reserves IDs 0 and 1 for SCSI hard disks. These IDs should not be used for other SCSI devices unless the host adapter BIOS is disabled. The AHA-1740/1742/1744 (Enhanced Mode) is an exception. Refer to the appropriate user's documentation for details.

SCSI Parity

If any SCSI device on the bus does not support SCSI parity generation, then parity checking must be disabled on every SCSI device on the bus.

In general, parity checking should be enabled when every SCSI device on the bus supports parity generation.

Structure of Installation Diskette

Root Directory

From the root directory on the ASW-1400 Installation Diskette, go to the *\os2\ver1_3* subdirectory to locate the following files:

mca.cmd – A batch file for Micro Channel® systems to be run only after successful LADDR installation.

update.cmd – A batch file which modifies an OS/2 v1.3 Install diskette to add LADDR support.

Subdirectories

Select these subdirectories from the *\os2\ver1_3* subdirectory:

cdrom – A directory containing all the files for CD-ROM support, including the CD-ROM driver and special file system.

disk0 – A directory containing all the LADDR binaries and files providing disk support using Adaptec SCSI host adapters.

update – A directory containing all batch and utility files that are called by *update.cmd*.

6 LADDR Installation

About This Chapter

Read this chapter to find out:

- How to install the LADDR I/O subsystem and the CD-ROM driver

▼▼▼▼ 6

Installation

This installation procedure replaces the I/O subsystem on an OS/2 v1.3 Install diskette with the LADDR I/O subsystem.

1 Write-protect and make duplicates of all your original OS/2 v1.3 Installation diskettes with a disk copy utility program. (You can write-protect a 5.25-inch diskette by covering the write-protect notch on the right side of the diskette with a small piece of tape, called a write-protect tab. A 3.5-inch diskette can be write-protected by sliding the write-protect tab to expose the write-protect hole.)

> **Note:** Do not install LADDR files on your original OS/2 diskettes. Save the original diskettes and work only with the duplicated diskettes.

2 Label your new (duplicate) OS/2 Install diskette as the OS/2 LADDR Install diskette and insert it in drive *A*.

3 Reset your system by pressing the **Ctl+Alt+Del** keys at the same time. When the logo title screen appears, press the **Esc** key to cancel the installation procedure and get to the OS/2 prompt.

4 Insert the Adaptec ASW-1400 or ASW-1420 diskette in drive *A*. Enter a:\os2\ver1_3\update /h for a list of supported options. Replace the *option* portion of the command in the next step with the appropriate host adapter type.

5 Enter a:\os2\ver1_3\update /*option* to invoke the batch update program for your Adaptec host adapter.

6 Follow the update instructions. The OS/2 LADDR Install diskette will be modified.

7 Press **Ctl+Alt+Del** to reboot the system. Follow the OS/2 installation procedures when the logo title screen appears. When prompted for the OS/2 Install diskette, be sure to use the OS/2 LADDR Install diskette that you created.

8 After you have successfully installed OS/2, a message appears telling you to remove the diskette from drive *A* and start OS/2 by pressing **Ctl+Alt+Del**.

Micro Channel LADDR Installation

Proceed with the following if you have a Micro Channel system:

1 Insert the OS/2 LADDR Install diskette in the floppy drive and boot from the floppy by pressing **Ctl+Alt+Del.**

2 When the logo title screen appears, press **Esc** to get to the OS/2 prompt.

3 Insert the Adaptec ASW-1400 or ASW-1420 diskette in drive *A*.

4 At the system prompt, enter a:\os2\ver1_3\mca to invoke the batch program for Micro Channel support.

5 Remove the diskette from drive *A* and press **Ctl+Alt+Del** to start OS/2.

CD-ROM Driver Installation

Both Microsoft and IBM OS/2 v1.3 support the following CD-ROM devices:

- Denon DRD-253
- Sony cdu-541 (SCSI-2)
- Toshiba txm-3301a1 (SCSI-2)

The Sony and Toshiba models listed are currently supported in both CD Data and CD Audio modes. The Denon model is *only* supported in CD Data mode and special instructions are required for CD Audio mode support. Refer to *Denon DRD-253 in Audio Mode* on page 6-6 for further information.

Also refer to the release notes for *Microsoft OS/2 v1.3* for additional information on CD-ROM support and IFS options.

Follow these steps to install the Adaptec CD-ROM driver on your system:

1 Copy the *ucdfs.dll* file from the *\os2\ver1_3\cdrom* directory on the Adaptec diskette to your *\os2\dll* directory or any directory in your *libpath.*

2 Copy the *cdfs.ifs* file from the *\os2\ver1_3\cdrom* directory on the Adaptec diskette to the root directory of your boot drive.

3 If you have a High Performance File System (HPFS) in your system, enter ifs=c:\cdfs.ifs as the second line of your *config.sys* file:

```
ifs=c:\os2\hpfs.ifs  /cache:64
ifs=c:\cdfs.ifs
```

If your system is a File Allocation Table (FAT) system, modify the *config.sys* file by adding the following line as the first line of the file:

```
ifs=c:\cdfs.ifs
```

4 Copy the *cdrom.tsd* and *stdcdrom.vsd* files from the *\os2\ver1_3\cdrom* directory on the Adaptec diskette to the *\cdrom* directory of your boot drive.

5 Add the following two lines to your *config.sys* file and be sure to enter the lines in the order listed:

```
device=c:\cdrom\stdcdrom.vsd
device=c:\cdrom\cdrom.tsd
```

Note: The order of the above two statements is *critical* to proper CD-ROM operation. You can use the OS/2 System Editor, which can be accessed from the **Group-Main** window.

6 Reboot your system to load the CD-ROM drivers.

Denon DRD-253 in Audio Mode

A special *.vsd* file is included to support audio on the Denon DRD-253. To enable audio, proceed as follows:

1. Copy the *denon.vsd* file found in the *\os2\ver1_3\cdrom* directory on the ASW-1400 or ASW-1420 diskette to the *\cdrom* directory of your boot disk.
2. Modify your *config.sys* file by adding:

   ```
   device=c:\cdrom\denon.vsd
   ```

   before the following statements in the file:

   ```
   device=c:\cdrom\stdcdrom.vsd
   device=c:\cdrom\cdrom.tsd
   ```

3. Reboot your system to load the CD-ROM drivers.

Adding AHA-1540/1542 Support

Use this procedure to add an AHA-1540/1542 host adapter to a system on which OS/2 v1.3 has already been installed. This installation procedure assumes the following:

- There were no Adaptec host adapters in the system when OS/2 v1.3 was originally installed.
- The system currently boots and runs properly.
- You now wish to add an AHA-1540/1542 host adapter and a SCSI disk drive to the system.
- You do not want to re-install OS/2 from scratch.
- You have the original OS/2 v1.3 boot diskette and the Adaptec ASW-1400 or ASW-1420 diskette.

If these assumptions are correct, continue with these steps:

1. Boot the system and wait until you see the OS/2 prompt.
2. Save a complete copy of all files in the root directory of drive C so that you can restore your original configuration if something goes wrong. To do this:

   a. Type **md save** from the root directory of C and press **Enter**.

   b. Type **copy c:*.* c:\save** and press **Enter**.

3 Insert the ASW-1400 or ASW-1420 diskette in the floppy drive, and copy files from the diskette to the root directory of *C* by entering these commands (type b: instead of a: if the diskette is in the *B* drive):

```
copy a:\os2\ver1_3\disk0\*.* c:\
copy a:\os2\ver1_3\disk0\1540\*.* c:\
copy a:\os2\ver1_3\disk0\share\*.* c:\
```

The directory structure may be different on some ASW diskettes. This step overwrites some of the system files. The original files are in the *\save* subdirectory you created earlier.

4 Shut down the system, and turn OFF the power.

> **WARNING:** Turn OFF and disconnect power to the system and external equipment before you remove the chassis cover and install the host adapter.

5 Install the AHA-1540/1542 host adapter in an available slot, following the instructions in the *User's Manual* or *Installation Manual*.

Although the host adapter default settings are correct for most systems, you may need to change the configuration to avoid IRQ, DMA or port address conflicts. Refer to the *User's Manual* or *Installation Manual*.

6 Reboot the system. The system should automatically load the necessary LADDR drivers to support the AHA-1540/1542 host adapter. No changes to the *config.sys* file are needed.

You can also use this procedure to install other kinds of host adapters, such as the AHA-1740/1742/1744, AHA-1640 or AHA-1520/1522. To do this, access the directory with the appropriate host adapter driver in step 3. For example, to install an AHA-1640, type:

```
copy a:\os2\ver1_3\disk0\1640\*.* c:\
```

If you are adding peripherals other than disk drives (e.g., CD-ROM drives), you may need to make changes to *config.sys*. See the *ASW-1400 Installation Manual* for more information.

7 Installing Under OS/2 v2.x

About This Chapter

Read this chapter to find out:

- The OS/2 v2.x command line switches for Adaptec host adapters

▼▼▼▼ 7

Command Line Switches for Adaptec Drivers

OS/2 adapter device drivers (*.add* files) are normally installed automatically and require no further information from you. In certain situations, however, you may wish to modify the behavior of the driver to meet your specific needs.

The command line examples in this chapter are shown with the Adaptec AHA-1542B host adapter driver. For your particular installation, substitute the appropriate Adaptec host adapter driver when entering command line information.

The standard format for command line switches is:

```
basedev=aha154x.add [Universal Parameters] [Adapter ID]
[Unit Parameters: [SCSI Target ID]]
```

Universal Parameters

/et

Allows embedded targets. This parameter indicates that the Adapter Device Driver (ADD) should assume that all targets have more than one Logical Unit Number (LUN) defined.

/!et

Does not allow embedded targets (default). This parameter indicates that the ADD should assume that all targets have only one LUN defined.

/v

Causes the driver name as well as the version number and the Adaptec copyright to be displayed if the driver loads successfully. Also displays information about all targets found in the system. (This switch is only valid in drivers dated 11/24/92 and later.)

Adapter ID

/a:*n*

Identifies the number of the adapter installed in the system. The adapter ID is determined when the driver is loaded and is based on the order that adapters are found in the system. Please refer to the section on each host adapter to determine the scanning order.

Unit Parameters

/dm

Enables Direct Access Storage Device (DASD) manager support (default). This parameter allows *os2dasd.dmd* to control the specified target(s) when they are identified as DASD devices.

/!dm

Disables DASD manager support. This parameter prevents *os2dasd.dmd* from controlling the specified target(s).

/sm

Enables SCSI manager support (default). This parameter allows *os2scsi.dmd* to control the specified target(s) if they are identified as non-DASD SCSI devices. All SCSI hard drives are controlled by *os2dasd.dmd*.

/!sm

Disables SCSI manager support. This parameter prevents *os2scsi.dmd* from controlling the specified target(s).

Example 1

Suppose that you have a removable hard drive as target 3 and you want to control the hard drive with an ASPI application and driver. Normally *os2dasd* allocates this device, treats it as a large floppy, and prevents you from sending any SCSI commands via ASPI. The following command line prevents *os2dasd.dmd* from accessing the target:

```
basedev=aha154x.add  /A:0  /!DM:3
```

Example 2

Suppose that you have a CD-ROM as target 4 on host adapter 0 and two DASD devices as targets 1 and 5 on host adapter 1. The following command line prevents *os2scsi.dmd* from accessing the CD-ROM and *os2dasd.dmd* from controlling the DASD devices. The driver searches for multiple LUNs on all host adapters:

```
basedev=aha154x.add /ET /A:0 /!SM:4 /A:1 /!DM:1,5
```

Important Tips

- There are no switches for controlling *os2aspi.dmd* directly. IBM did not define them in their specification and we cannot be sure that other host adapters will have the same switches.
- *Do not* disable DASD manager access to the boot drive if you are booting from your SCSI host adapter. If you do, your system will be unable to boot.

> **Note:** The SCSI target ID is the target to which the Unit Parameters are applied. This parameter may be a single ID (d) or a list of IDs (d,d,d).

Driver Specific Information

aha152x.add

This driver can support two host adapters and searches for them at ports 340h and 140h. Boards are assigned adapter numbers in the order they are found.

Configuration information is typically obtained from system configuration (CMOS) memory or from host adapter jumper settings, but this information may be overridden by these parameter switches.

Universal Parameters

/sn

Allows the host adapter to initiate synchronous negotiation after a SCSI bus reset or after a bus device reset. (This is the default setting.)

/!sn

Prevents the host adapter from initiating synchronous negotiation. However, the host adapter will always accept synchronous negotiation initiated by a SCSI target device.

Special Unit Parameters

/d
Allows targets to disconnect from the SCSI bus (default).

/!d
Prevents targets from disconnecting from the SCSI bus.

/h:*x*
Specifies the host adapter SCSI ID. A number from 0-7 replaces *x*. The default ID is 7. If you specify an invalid number, the default is used.

/y
Enables parity checking on the SCSI bus (default).

/!y
Disables parity checking on the SCSI bus.

aha154x.add

This driver can support four host adapters, distributed among six possible port addresses. The port addresses are scanned in the following order: 330h, 334h, 230h, 234h, 130h, 134h. Boards are assigned adapter numbers in the order they are found.

Special Unit Parameters

/bon:*t*
Allows the bus-on time to be set to a value between 2 and 15 microseconds. The default value of 7 microseconds should be used for most systems.

/boff:*t*
Allows the bus-off time to be set to a value between 1 and 64 microseconds. The default value of 4 microseconds should be used for most systems.

/d
Allows targets to disconnect from the SCSI bus (default).

/!d
Prevents targets from disconnecting from the SCSI bus.

> **Note:** The /d and /!d commands are not supported on boards earlier than revision B.

aha164x.add

This driver can support host adapters installed in any 16-bit Micro Channel Architecture slot. Slots are scanned twice, first for boards with BIOS enabled, then for boards with BIOS disabled. Boards whose BIOS is enabled are assigned host adapter numbers by BIOS address (lowest to highest). Boards whose BIOS is disabled are assigned host adapter numbers by slot number (lowest to highest).

aha174x.add

This driver can support host adapters installed in any EISA slot. Slots are scanned twice, first for boards with BIOS enabled, then for boards with BIOS disabled. Boards whose BIOS is enabled are assigned host adapter numbers by BIOS address (lowest to highest). Boards whose BIOS is disabled are assigned host adapter numbers by slot number (lowest to highest).

Microsoft Windows NT

Section 3

Chapter 8 Microsoft Windows NT

8 Microsoft Windows NT

About This Chapter

Read this chapter to find out:

- How to add, swap and remove Adaptec host adapters in systems running Microsoft Windows NT
- How to use software parameters to change the configuration of Microsoft Windows NT drivers

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General Product Information

Microsoft Windows NT includes embedded drivers for Adaptec host adapters. You do not need any separate Adaptec software disks to use these drivers. During the installation process, Windows NT automatically scans for Adaptec host adapters and displays the appropriate message when it finds a supported host adapter board or host adapter chip.

Windows NT then loads the driver for the host adapter and copies the NT system files from the CD-ROM to the hard disk.

These three Adaptec drivers are embedded in Windows NT. Listed on the right are the host adapter models supported by each driver.

Driver Name	Supported Adaptec Hardware
sparrow.sys	AHA-1510, AHA-1520, AHA-1522, AIC-6260, AIC-6360
aha154x.sys	AHA-1540, AHA-1542, AHA-1640 AHA-1740, AHA-1742, AHA-1744 (Standard Mode)
aha174x.sys	AHA-1740, AHA-1742, AHA-1744 (Enhanced Mode)

Changing Hardware Configuration

This section explains how to make the following hardware changes to your computer without reinstalling Windows NT:

- Add an Adaptec host adapter of a type that is already installed on your system
- Add a different type of Adaptec host adapter
- Swap an Adaptec host adapter for a different type of host adapter
- Remove an Adaptec host adapter

These operations are similar but have important distinctions, as described in the following sections. Read the instructions carefully before you change your system configuration.

Adding a Host Adapter of the Same Type

No software changes are needed if you want to add an Adaptec host adapter to a system that already has an installed host adapter of the same type (for example, if you want to add an AHA-1540C to a system that already has one or more installed AHA-1540C boards). The steps are as follows:

1. Shut down Windows NT.
2. Power off your computer and physically install the new host adapter in an available slot.

   Caution: Always refer to your computer's documentation for instructions on opening the system cover and adding option boards.
3. Verify that there are no system resource conflicts (e.g. interrupt request level or DMA channel) between the new host adapter and other hardware installed in the computer and that hardware configuration jumpers or switches are set properly on the new host adapter.
4. Restart the computer and, if necessary, run the EISA Configuration utility before Windows NT reboots.

Adding a Host Adapter of a Different Type

If you want to add a new type of host adapter to your system, you must perform additional steps to ensure that the device driver for the new host adapter is both installed on your system disk and is enabled. First, physically install the host adapter as described in the previous section. Then, reboot Windows NT and do the following:

1. Select and start the *Windows NT Setup* program. (Its icon is usually found in the Main program group.) There will be a brief pause while *Windows NT Setup* scans your hardware configuration.
2. Select the Options pull-down menu and select **Add/Remove SCSI Adapters**. The SCSI Adapter Setup program displays a list of the types of host adapters currently installed.
3. Click on the **Add** button to add another host adapter type to the list. Expand the list and select the type of host adapter to be added–for example, **Adaptec 2740/AIC 777x**.

4 Click on the **Install** button.

At this point, *Windows NT Setup* checks to see if the specified driver (in this example, *arrow.sys*) has already been copied to the system disk. If this type of host adapter was previously installed, the message The driver(s) for this SCSI adapter are already on the system is displayed.

5 Click on **Current** if you want to use the existing device driver or click on **New** if you want to replace it. If you select **Current**, skip to step 7.

If the device driver has never been installed or if you want to replace the current device driver, *Windows NT Setup* prompts you to Please enter the full path to the Windows NT SCSI Adapter files.

6 If necessary, change the path to the directory with the desired device driver, then click on **Continue**.

When you click on **Continue**, the device driver is copied to your system disk and the Windows NT configuration is updated so that the new device driver loads when Windows NT is rebooted.

7 When the installation is complete, *Windows NT Setup* again displays a list of currently installed host adapter types. Verify that the new host adapter appears on the list.

8 Add other types of host adapters if necessary (see step 3 above), or click on **Close** to exit the SCSI adapters portion of *Windows NT Setup* and then close the program.

9 When you see the message The changes you have made will not take effect until the computer is restarted, click on **OK** to exit.

If this message does not appear, no changes have been made to the Windows NT system configuration.

10 Restart your computer. When you restart Windows NT, it is possible that some drive letter assignments will change from the previous configuration.

Swapping a Host Adapter

Swapping one type of host adapter for another is similar to the procedure for adding a new type of host adapter. The important distinction is that you make all software configuration changes while Windows NT is running with the host adapter you want to swap.

1. Make sure that the device driver for the replacement host adapter is installed on the Windows NT system. If necessary, install the driver by following the procedure described in *Adding a Host Adapter of a Different Type* on page 8-4.

   It is not essential to remove the device driver for the host adapter you are replacing. Windows NT dynamically detects the absence or presence of host adapter hardware, and no problems should arise if you leave the existing device driver installed. You may remove the device driver later, after you have successfully rebooted Windows NT.

2. Once the new device driver is installed, shut down Windows NT and replace the existing host adapter, as described in *Adding a Host Adapter of the Same Type* on page 8-4.

3. Restart your computer. When you restart Windows NT, it is possible that some drive letter assignments will change from the previous configuration.

   Caution: If the host adapter you are swapping controls the system boot device, you must follow the additional steps in the next section in order for Windows NT to work correctly.

Swapping the Boot Host Adapter

Windows NT boots in a two-stage process. In the first stage, no software configuration is available and Windows NT loads the device driver to control the system boot disk from the file *c:\ntbootdd.sys*. Therefore, when you perform the steps described above to swap a host adapter you must also explicitly copy the device driver (in this example, *arrow.sys*) to *c:\ntbootdd.sys*.

ntbootdd.sys is always located on your C drive, even if a different disk is the system disk once Windows NT is booted. An example of this would be a system in which your C disk is an IDE disk with MS-DOS installed, and Windows NT is installed on SCSI disk *D*.

Removing a Host Adapter

Removing a host adapter can be as simple as physically removing it from the slot when your computer is shut down. Windows NT boots and functions properly in this configuration, but a warning message is generated every time you boot Windows NT.

To eliminate the warning message, you must update the Windows NT software configuration, as described in these steps:

1. Select and start the *Windows NT Setup* program. (Its icon is usually found in the Main program group.) There will be a brief pause while *Windows NT Setup* scans your hardware configuration.

2. Select the Options pull-down menu and select **Add/Remove SCSI Adapters**. The SCSI Adapter Setup program displays a list of the types of host adapters currently installed.

3. Select the type of host adapter you want to remove and click on the **Remove** button. When the *Windows NT Setup* program asks you for confirmation, click on **OK**.

   Because SCSI device drivers are loaded during system boot and because they may be needed to load Windows NT itself, the following warning message is displayed:

   > The SCSI Adapter has been marked as a boot device. Removing it may cause the system not to boot.

4. If you are sure you are removing the correct host adapter type, click on **OK**.

5. Return to step 3 if you want to remove driver support for other types of host adapters, or click on **Close** to exit the SCSI adapters portion of *Windows NT Setup*.

6. Close the *Windows NT Setup* program. When the following message appears:

   > The changes you have made will not take effect until the computer is restarted.

   click on **OK** to exit. If this message does not appear, no changes have been made to the Windows NT system configuration.

7. Restart your computer. Note that *Windows NT Setup* does not delete the device driver from your system disk; it only updates

Windows NT software configuration information so that the device driver is no longer loaded during system boot.

> **Caution:** If you have removed a host adapter but still have other host adapters of the same type installed in your system, do *not* use *Windows NT Setup* to remove the device driver.

Updating a Device Driver

If a software update is available for a particular host adapter device driver, you may update your Windows NT system without any hardware or software configuration changes by following these steps:

1. Copy the new device driver to the directory *Xxxxx\System32\Drivers*, where *Xxxxx* is the system root of Windows NT (typically named *\winnt*).
2. If you are updating the device driver that controls the system boot device, copy the same driver to the file *c:\ntbootdd.sys*.
3. Shut down and restart your system.

Configurable Parameters

You can use software parameters to alter the configuration of most of the Windows NT device drivers supplied by Adaptec. All Windows NT configuration information is stored in a data structure called the Registry. You can edit this information through a tool called the Registry Editor.

The Registry Editor is not installed by default as a Windows program item during system installation. Follow these steps to set it up and access the configuration information:

1. Create a new program item in a program group of your choice. Name the program item **Registry Editor** and assign it a command line of regedt32.
2. Invoke the Registry Editor by double clicking on this icon.

   The general structure of the Registry is identical for all types of Adaptec SCSI device drivers.
3. Select the window labelled **[HKEY_LOCAL_MACHINE on Local Machine]**. From the tree structure that is displayed,

double click on **SYSTEM** to expand a level of the branch, then double click on **CurrentControlSet** and finally on **Services**.

Under **Services** are displayed nodes for all the Windows NT system services that are started during a system boot. These include the SCSI device drivers. For example, the node **Aha154x** controls the configuration of the AHA-154X device driver, while the node **Sparrow** is for AHA-151X/152X configuration information.

The structure of the Registry tree is manipulated by commands selected from the **Edit** pull-down menu. Use **Add Key** to create a named node in the Registry, **Add Value** to create a named value entry associated with a particular node or **Delete** to remove items from the Registry.

You may edit an existing value entry by double clicking on the value entry in the right-hand window of the Registry Editor.

Windows NT Parameters

Generic configuration information interpreted by the Windows NT SCSI Manager for SCSI device drivers is stored in **Parameters\DeviceN**, where:

- **Parameters** is a named node underneath the **Xxxxxx** node in the Registry tree (where *Xxxxxx.sys* is the name of the SCSI device driver), and
- **DeviceN** is a named node that indicates the number of the host adapter (the first host adapter within a class is 0, the second is 1, etc.).

You may create any of the following value keys under the **Parameters\DeviceN** node to control the behavior of the Nth host adapter of the class. Give each value key a data type of REG_DWORD.

InitiatorTargetId

Specifies the SCSI ID (0 to 7 inclusive) that the host adapter is to use as its own (initiator) ID. You should not use this parameter if the host adapter controls the Windows NT boot device or if it is the same type of host adapter as the one that controls the system boot device.

DisableSynchronousTransfers
A nonzero value indicates that the SCSI host adapter is not to initiate synchronous negotiations (but it may still accept negotiations initiated by a SCSI target).

DisableDisconnects
A nonzero value indicates that targets are not permitted to disconnect during the execution of a SCSI command.

MaximumLogicalUnit
This can limit the scan for connected devices on the SCSI bus. If 1 is specified, the Windows NT SCSI Manager assumes that no SCSI targets support LUNs other than 0. Otherwise, LUNs from 0 to n-1 are scanned during system initialization.

> **Note:** Any of the above value keys may be created under the node **Parameters\Device**. Windows NT applies this configuration information to all host adapters of the type specified, unless you specifically override the parameter under a Registry node **Parameters\DeviceN** to apply only to the Nth host adapter.

Driver Specific Parameters

Configuration information for SCSI device drivers is stored in **Parameters\DeviceN\DriverParameters**, where:

- **Parameters** is a named node underneath the **Xxxxxx** node in the Registry tree (where *Xxxxxx.sys* is the name of the SCSI device driver)
- **DeviceN** is a named node that indicates the number of the host adapter (the first host adapter within a class is 0, the second is 1, etc.), and
- **DriverParameters** is a named value entry that takes the form of a string of parameter information that is unique to each SCSI device driver.

The remaining sections discuss parameter switches maintained in **DriverParameters** that are unique to a specific SCSI device driver.

> **Note:** Changes made with the Registry Editor do not take effect until you shut down and then restart your system.

AHA1510, AHA152X and AIC-6X60

Within the string **DriverParameters**, the following switches are recognized, independent of their order, by the *sparrow.sys* device driver. If a parameter is not specified, the value obtained either from switches, jumpers or the AIC-6X60 stack remains in effect or (if none of the preceding is available) the hard coded default values summarized under the /z option are used.

Only one of the two options may be specified for parameters such as /c and /c- that take ON/OFF or TRUE/FALSE values.

/an

specifies which DMA channel is to be used for data transfer phases if /td is specified. Possible choices are 0 for 8-bit DMA and 5, 6 or 7 for 16-bit DMA. Channels 5, 6 and 7 are not supported by the AIC-6260; if the */a* option specifies one of these channels for an AIC-6260 it is ignored, and programmed IO is used instead.

/c

prevents SCSI targets from disconnecting during command execution.

/c-

allows SCSI targets to disconnect during command execution.

/e

enables the AIC-6360 Enhanced Mode capabilities. It is ignored if an AIC-6260 is detected.

/e-

disables the AIC-6360 Enhanced Mode capabilities.

/fnn

controls the minimum amount of time, in microseconds, that the AIC-6X60 relinquishes the system bus during DMA data transfers. The value entered may be from 0 to 15.

/hn

specifies the SCSI ID to be used by the AIC-6X60 host adapter for its own (initiator) ID. You should not use this parameter if the AIC-6X60 is the Windows NT boot device. The ID may be any number between 0 and 7.

/nnn
controls the maximum amount of time, in microseconds, that the AIC-6X60 holds use of the system bus for DMA data transfers before it is relinquished. The value entered may be from 0 to 15.

/qn
allows the specification of the interrupt request level, which may be 9, 10, 11 or 12.

/s-
disables the synchronous capabilities of the AIC-6X60. Synchronous negotiations initiated by SCSI targets are rejected and asynchronous data transfers are used. This option is intended for debugging or Technical Support use; the default is for synchronous capabilities to be enabled (see also /u).

/td
Information transfer during a DATA IN or DATA OUT phase is performed using second party DMA with the channel specified by the /a parameter. This option is ignored (and data transfer reverts to programmed IO) if an EISA DMA controller is not present. Only /td or /tp may be specified.

/tp
causes programmed IO to be used for information transfer during DATA IN or DATA OUT phases. Only /tp or /td may be specified.

/u
specifies that the AIC-6X60 host adapter is to initiate synchronous negotiations after a SCSI bus reset or a BUS DEVICE RESET message sent to a target.

/u-
specifies that the AIC-6X60 host adapter is not to initiate synchronous negotiations. If a SCSI target initiates negotiations, the host adapter permits synchronous data transfer (unless /s- has been specified).

/y
prevents parity checking on the SCSI bus. SCSI parity generation is always enabled.

/y-
enables parity checking on the SCSI bus.

/z
sets all options to their default values, as described below. It is the first option parsed from the parameters string, so individual options may explicitly be set to other values. /z is equivalent to:

```
/c- /tp /y- /u /h7 /q11 /n15 /f1
```

You must be careful how you specify some of the above switches. The host adapter will not function properly if the switch settings do not match other hardware configuration information. Specifically, the DMA channel specified by the /a switch must match the jumper or CMOS configuration and /td must not be used to specify the use of DMA unless the hardware has been configured to select DMA channel 0, 5, 6 or 7. The converse is not true: /tp may always force the use of programmed IO even if the hardware has been configured for DMA.

AHA154X, AHA1640 and AHA174X (Standard Mode)

Within the string **DriverParameters**, the following switches are recognized, independent of their order, by the *aha154x.sys* device driver.

> **Note:** Individual switches in the **DriverParameters** string must be terminated by a semicolon.

BusOnTime=n;
sets the maximum bus on time for the host adapter to *n* microseconds. Permissible values are 2 to 15, and the default is 11 microseconds.

BusOffTime=n;
sets the minimum bus off time for the host adapter to *n* microseconds. Permissible values are 1 to 64, and the default is four microseconds.

Troubleshooting

The boot manager for Windows NT contains recovery logic to allow you to return to the *last known good* configuration. If you have changed your host adapter configuration and Windows NT no longer boots, follow these steps to recover:

1. Undo any hardware changes you have made to the system since it was last operational.
2. Reboot the system. Watch the display carefully during the boot. If this message appears:

   Windows NT(TM) will not start because of configuration changes. Press spacebar NOW to invoke the Last Known Good menu

   press the **Spacebar** and follow the instructions on the screen to continue booting with the *last known good* configuration.
3. Once your system is operational again, double-check all of the hardware and software configuration changes you want to make. Look specifically for conflicts with parts of the existing system configuration that are not being changed.

If you cannot determine the source of the error, contact Adaptec Technical Support for assistance at the telephone number listed at the front of this manual.

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SCO Unix and SCO Open Desktop

Section 4

Chapter 9 SCO UNIX Introduction

Chapter 10 Installation

Chapter 11 Changing the Host Adapter Type

Chapter 12 Using Multiple Host Adapters

Chapter 13 Operating Notes

9 SCO UNIX Introduction

About This Chapter

Read this chapter to find out:

- General information on the ASW-1450 SCO UNIX manager, which provides Adaptec host adapter support under SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0
- General information on the Adaptec drivers embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0
- A list of the resources required to install and use the ASW-1450 and the embedded Adaptec drivers

▼▼▼▼ 9

General Product Information

A SCSI manager is a set of software programs used to integrate support for SCSI host adapters into a computer's operating system. A SCSI host adapter allows various SCSI peripheral devices to be connected to one or more host adapter boards in the system.

This section explains how to use Adaptec's drivers and other software products with SCO™ UNIX® and SCO Open Desktop. The way in which you use the Adaptec software to access your host adapters depends on which version of the SCO environments is installed on your system.

If you have installed SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0, you will use the ASW-1450 SCSI manager, which includes drivers for Adaptec's AHA-1540 family, AHA-1640 and AHA-1740 family host adapters.

If you have installed SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0, you do not need a separate host adapter driver package, because the Adaptec drivers are included (embedded) in the SCO software products.

The following sections of this chapter list the features of the Adaptec drivers used with the two versions of SCO UNIX and Open Desktop.

The AHA-1740 family of bus master host adapters has an associated utility package (*ASW-C174*), which may be required to install the board correctly in the system if the SCSI Board Configuration (*!adp0000.cfg*) and SCSI Bus Configuration Overlay (*adp0000.ovl*) files are not included with the vendor-supplied configuration utility.

SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0

SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0, with the ASW-1450 installed, support two types of Adaptec host adapters. The following table lists the supported host adapters and their associated driver prefixes:

Host Adapter Driver Prefix	Supported Adaptec Host Adapters
ad	AHA-1540/1542 (16-bit ISA) AHA-1640 (16-bit Micro Channel) AHA-1740/1742/1744 (32-bit EISA Standard Mode)
eiad	AHA-1740/1742/1744 (32-bit EISA Enhanced Mode)

The AHA-1540 and AHA-1640 families are software-compatible. The AHA-1740 family may be operated either in Standard Mode (compatible with the AHA-1540 family) or in Enhanced Mode.

ASW-1450 Features

The ASW-1450 provides SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0 with the following features:

- Support for the use of two host adapter boards in a computer

  The host adapters can be of the same type or of different types.

- The addition of a driver, *eiad*, for the AHA-1740 family operating in Enhanced Mode

  AHA-1740 family host adapters are 32-bit Extended Industry Standard Architecture (EISA) boards. They can operate in either Enhanced Mode, which uses the *eiad* driver, or in Standard Mode, which uses the *ad* driver. Standard Mode allows full EISA operation, and is completely compatible with existing software written for the AHA-1540 and AHA-1640 families. Enhanced Mode implements SCSI-2 tag queuing and scatter-gather capabilities, as well as other internal AHA-1740 family features which provide increased performance.

  – *Tag queuing* (also called command queuing) is a SCSI-2 feature that allows disk read and write commands to be queued within a disk drive's memory, allowing the drive to sort commands for optimum efficiency.

- *Scatter-gather* is an operating system and hardware feature that allows several sequential read or write operations to be combined and performed at the same time, even though the system buffers for those operations might not be physically contiguous in memory. The net result is an increase in throughput.

- A new version of the *ad* driver which is used for the AHA-1540 and AHA-1640 family host adapters, as well as for the AHA-1740 family operating in Standard Mode

  ad considerably increases performance over the *ad* driver in the kernel through use of more efficient functions, such as scatter-gather.

- A new command, change_ha, that allows you to change the host adapter type associated with any SCSI device (see *Using the change_ha Utility* on page 11-3)

- A new command, eisa, that displays a report on boards configured on the EISA bus (see *Manual Excerpt for eisa (ADM)* on page 13-15)

- A new version of the SCSI hard disk driver, *Sdsk*, that provides tag queuing (a SCSI-2 enhancement) and scatter-gather

- A new version of the SCSI tape driver, *stp*, that allows simultaneous access to tape devices on different types of host adapters

- A new version of the CD-ROM driver, *srom*, that allows multiple processes to access the CD-ROM device

- Enhancements to configuration utilities such as *mkdev hd* to support the configuration and use of two host adapters

- A new *tar* binary with improvements that prevent *tar* from inappropriately ignoring files with certain nodes

System Configuration

The following resources are required to install and use the ASW-1450:

- An Intel® 80386- or 80486-based computer
- The SCO UNIX System V/386 Release 3.2 v2.0 operating system or SCO Open Desktop Release 1.1.0

  You may install either version of UNIX using the Standard Mode driver provided in the UNIX kernel before attempting to install the ASW-1450.
- The operating system Link Kit package
- Either the AHA-1540/1542 (for an ISA/AT-bus system) or AHA-1740/1742/1744 (for an EISA-bus system)

To use the EISA features provided by the Adaptec drivers, you need at least one host adapter board from the AHA-1740 family:

- AHA-1740 or 1740A EISA-to-Fast SCSI bus master host adapter
- AHA-1742A EISA-to-Fast SCSI bus master host adapter with floppy disk controller
- AHA-1744 EISA-to-Differential Fast SCSI bus master host adapter

You do not need any additional storage space or RAM.

SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0

SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0 have embedded support for SCSI host adapters. This includes the drivers in the ASW-1450, described in the previous section, and the non-bus master driver in the ASW-1250.

> **Caution:** Because the Adaptec drivers are embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0, you *must not* install the ASW-1450 on top of these products. If you do, you may corrupt files and lock your system. If you do accidentally install the ASW-1450, see *Removing the ASW-1450 from SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0* on page 10-8.

The following table lists the embedded Adaptec drivers and the hardware they support:

Host Adapter Driver Prefix	Supported Adaptec Hardware
ad	AHA-1540/1542 16-bit ISA host adapter AHA-1640 16-bit Micro Channel host adapter AHA-1740/1742/1744 32-bit EISA (Standard Mode) host adapter
eiad	AHA-1740/1742/1744 32-bit EISA (Enhanced Mode) host adapter
spad	AHA-1520/1522 16-bit AT host adapter AIC-6260 16-bit AT single-chip host adapter

Features

The embedded Adaptec drivers in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0 have all the functionality of the ASW-1450, plus these additional features:

- *spad* for the AHA-1520/1522 family of host adapters and the AIC-6260 single-chip host adapter

  spad can support one host adapter.

- Support for more than two host adapters with *ad* and *eiad*

  - *ad* can support four host adapters. This is the maximum number of DMA lines available for the AHA-1540 family of host adapters.
  - *eiad* can support as many AHA-1740 host adapters as your system will accommodate, which is limited by the number of available slots.

- The tag queuing feature is enabled by default on the *sdsk* driver, which is part of the SCO UNIX packages.

System Configuration

The following resources are required to use the embedded Adaptec drivers:

- An Intel 80386- or 80486-based computer
- SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0
- The operating system Link Kit package
- Either the AHA-1540/1542 (for an ISA/AT-bus system), the AHA-1740/1742/1744 (for an EISA-bus system) or the AHA-1520/1522 (for a PIO AT-based system)

To use the EISA features provided by the Adaptec drivers, you need at least one host adapter board from the AHA-1740 family:

- AHA-1740 or 1740A EISA-to-Fast SCSI bus master host adapter
- AHA-1742A EISA-to-Fast SCSI bus master host adapter with floppy disk controller
- AHA-1744 EISA-to-Differential Fast SCSI bus master host adapter

You do not need any additional storage space or RAM.

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10 Installation

About This Chapter

Read this chapter to find out:

- How to use the embedded Adaptec drivers included with SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0
- How to install the ASW-1450 SCO UNIX manager for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0

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Using the Embedded Drivers in Current Versions of SCO UNIX and SCO Open Desktop

The Adaptec host adapter drivers are embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0. If you have installed one of these products on your system, you do not need any additional Adaptec software to access your host adapters.

See Chapter 2, *Running the Fresh Installation*, or Chapter 3, *Running the Update Installation*, in the *SCO UNIX Operating System Installation Manual* for instructions on updating or installing the current releases of SCO UNIX and SCO Open Desktop.

Installing the ASW-1450 for SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0

After you have installed SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0, follow these steps to install the ASW-1450:

1. At root, type custom and press **Return**. The custom main menu appears with the **Install** option highlighted.
2. Select **Install** from the custom main menu by pressing **Return**.
3. Choose **A New Product** from the next menu by pressing **Return**. A new menu appears.
4. Press **Return** to choose the option **Entire Product** from the displayed menu. This selection installs the ASW-1450 package. You are prompted to insert Distribution Volume 1.
5. Insert the Manager diskette into floppy disk drive 0 and press **Return** to continue. You will see the messages:

```
Installing custom data files
Executing product prep script
Creating file lists
```

You are prompted to insert the ASW-1450 Floppy Volume 1.

6 Be sure that the diskette is properly inserted and press **Return** to continue. You will see the messages:

```
Extracting Files
Executing ASW-1450 Init Script
Installing ASW-1450
```

If the Link Kit package is not installed, you are prompted to install it now. If the Link Kit package is installed, you see the message:

```
Updating system configuration
```

7 You are automatically placed in the *change_ha* utility, which allows you to change the host adapter type of any SCSI device. A screen similar to the following appears:

```
The SCSI configuration file has entries for the
following devices:

Host
Adapter                    Adapter
Type        Devices        Number      ID      LUN
---------   ---------      ---------   -----   -----
ad          disk           0           0       0
ad          tap            0           2       0

Do you wish to change the Host Adapter Type for
any of these entries?  (y / n)
```

Figure 10-1. change_ha Utility Screen

If you decide not to change the host adapter type now, do not use the EISA configuration utility to change the host bus adapter to Enhanced Mode after you complete this installation procedure.

Remember that any host adapter-type changes that you make with *change_ha* must be supported by corresponding changes to the hardware configuration using a vendor provided EISA configuration utility, and vice versa.

Enter n if you do not want to change any of the host adapter types now. You must invoke *change_ha* later to use the AHA-1740 family host adapter in Enhanced Mode. Proceed to step 9.

Enter y to change host adapter types now. The AHA-1740 family product defaults to Standard Mode in order to be compatible with the wide selection of driver and manager software already available for the AHA-1540 and AHA-1640 host adapter families. You should enter y to change the host adapter type to take advantage of the features of Enhanced Mode. A screen similar to this one appears:

```
For each entry, indicate whether you wish to change
the Host Adapter Type the device is attached to.

Host
Adapter                          Adapter
Type          Devices            Number      ID      LUN
-----------  ---------  --  ----------  ------  -------
ad            disk                  0       0        0

Change the Host Adapter Type?  (y / n)
```

Figure 10-2. Current Host Adapter Configuration

This screen displays the current host adapter configuration for one of your devices, and asks if you want to change it. Note that your screen may differ from this sample display. Enter y to change the host adapter type for this entry or n to move to the next entry. If you enter y, this message appears:

```
Enter the new Host Adapter prefix, 'h' for help or 'q'
to quit:
```

8 To attach the device to the AHA-1740 family host adapter using Enhanced Mode, enter eiad (the host adapter prefix for the AHA-1740 family host adapter Enhanced Mode driver) at the prompt. Otherwise, enter the prefix for the new host adapter to which you are connecting the device. Refer to the table on page 9-4 for a list of prefixes. The *change_ha* utility now displays configuration information for your next SCSI device and again asks whether you want to change it now. Answer the prompts as described previously for each device.

When you have answered the prompts for all of your SCSI devices, *change_ha* displays the new SCSI configuration file entries. These entries reflect all of the changes that you made, if any.

The following prompt appears:

> Do you wish to change the Host Adapter Type for any of these entries? (y/n)

9 If you have finished changing the entries, enter n to leave *change_ha*. The following message appears:

> A new kernel must be built to reflect the changes to the SCSI configuration. Do you want to do this now? (y/n)

If you *do not* want to rebuild the kernel, continue with step 10. If you *do* want to rebuild the kernel, skip to step 12.

10 If you **do not** want to relink the kernel now, enter n. This message appears:

> You MUST relink the kernel for the ASW-1450 to take effect. The kernel must be relinked if *change_ha* was used to attach any device to the *eiad* driver before the vendor-provided configuration utility is used to configure a AHA-1740 family host adapter in Enhanced Mode. To relink the kernel, change to the */etc/conf/cf.d* directory and enter ./link_unix. Press <Return> to continue.

Press **Return** to go back to the custom menu and then press any key to return to the main menu.

11 Select **Quit**. Another menu appears. Choose **Yes** to leave custom. Then continue with step 17.

12 If you *do* want to rebuild the kernel now, enter y. The following message appears:

> The UNIX Operating System will now be rebuilt. This will take a few minutes. Please wait. Root for this system build is /. The UNIX kernel has been rebuilt. Do you want this kernel to boot by default? (y/n)

13 Enter y. The following message appears:

> Backing up /unix to /unix.old Installing new /unix. The kernel environment includes device node files and /etc/inittab. The new kernel may require changes to /etc/inittab or device nodes.
> Do you want the kernel environment rebuilt? (y/n)

14 Enter **y**. You see messages confirming the kernel linking. When finished, the following message appears:

```
Installation of ASW-1450 is now finished
```

15 Press **Return** and then press any key to go back to the custom menu. The following message and the custom menu appear:

```
Checking file permissions
```

16 Select **Quit** to leave the custom menu, then choose **Yes** to leave custom.

17 Remove the ASW-1450 diskette from the floppy disk drive.

18 Enter **shutdown -g0 -y** to reboot your system and enable the configuration changes that you made during the installation procedure.

If you changed any of the prefixes during this installation procedure, you must update your hardware configuration as follows:

- If you are using an AHA-154XB or AHA-1640, refer to the host adapter manual to determine the jumper settings for interrupt, DMA and port address.
- If you are using an AHA-154XC, change the settings as needed with the software configuration utility built into the board. Press **Ctrl-A** during bootup to access this utility. (See the host adapter manual for more details.)
- If you are using an AHA-1740, run the EISA configuration utility and set the board to either Enhanced Mode or Standard Mode.

  Note: Use the EISA configuration utility only with the AHA-1740 host adapter. It has no effect on AHA-1540 and AHA-1640 boards.

Removing the ASW-1450 from SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0

You should *not* try to install the ASW-1450 with SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0, because the Adaptec drivers are already embedded in these SCO platforms. If you accidentally install the ASW-1450, you will not be able to use your system. Follow these steps to remove the ASW-1450.

1. Login as root.
2. Invoke the *custom* utility. The custom main menu appears with the **Install** option highlighted.
3. Select **Install** by pressing **Return**. A new menu will appear.
4. Select **SCO UNIX System V Operating System** by pressing **Return**.

   If you have SCO Open Desktop Release 2.0 select **Open Desktop Personal System**.
5. Select **Service Components** by pressing **Return**.
6. Select **SCO UNIX System V Extended Utilities** by pressing **Return**.

   If you have SCO Open Desktop Release 2.0 select **Unix Extended Utilities**.
7. Select **Files** by pressing **Return**.
8. A list of packages will be displayed on a new menu. Select **LINK** package (the Link utility package) by pressing **Return**.
9. A list of files in the LINK package will be displayed on another menu. Select all the following 14 files and press **Return** when done. (Press the **Space Bar** to select a file. An asterisk will appear in front of the names of selected files.)

   ./etc/conf/bin/idscsi
   ./etc/conf/cf.d/link_unix
   ./etc/conf/pack.d/Sdsk/Driver.o
   ./etc/conf/pack.d/Sdsk/stubs.c
   ./etc/conf/pack.d/Srom/Driver.o

./etc/conf/pack.d/Sdsk/space.c
./etc/conf/pack.d/Stp/space.c
./etc/conf/pack.d/ad/Driver.o
./etc/conf/pack.d/Stp/Driver.o
./etc/conf/pack.d/ad/space.c
./etc/conf/pack.d/eiad/Driver.o
./etc/conf/pack.d/eiad/space.c
./usr/include/sys/Sdsk.h
./usr/include/sys/adaptec.h
./usr/include/sys/scsi.h

10 The *custom* utility will prompt you to insert the request volume(s) for installation. This will recover all the above files from the SCO UNIX v3.2.4 Distribution.

11 Repeat steps 3 through 5. That is, select **Install/SCO UNIX System V Operation System/Service Components.**

12 Select **SCO UNIX System V Runtime System** by pressing **Return**.

If you have SCO Open Desktop Release 2.0 select **Unix Runtime System**.

13 Select **Files** by pressing **Return**.

14 Select the **RTS** package (the UNIX Run Time System) and press **Return**.

15 A list of files in the RTS package will be displayed on another menu. Select the following three files and press **Return** when done. (Press the **Space Bar** to select a file. An asterisk will appear in front of the names of selected files.)

./etc/eisa
./usr/lib/mkdev/.scsi
./usr/lib/mkdev/hd

16 The *custom* utility will prompt for the request volume(s) for installation. This will recover all the above files from the SCO UNIX v3.2.4 Distribution.

17 Exit the *custom* utility by selecting **Quit** and pressing **Return**.

All the files that are overwritten by the ASW-1450 v1.0 installation have been recovered at this point.

Before rebuilding the kernel, check the following files:

1. Go to the */etc/conf/cf.d/mscsi* file. Be sure the host adapter prefix corresponds to the kind of host adapter you are using. (See the table on page 9-7.)

2. Go to the */etc/conf/sdevice.d* directory. If you are going to use the AHA-1540 driver, make sure the second entry in the *ad* file is Y. The line in the *ad* file should look like this:

   ```
   ad Y 1 5 0 0 330 332 0 0
   ```

   If you are going to use the AHA-1740 Enhanced Mode driver, the line in the *eiad* file should look like this:

   ```
   eiad Y 1 5 0 0 0 0 0 0
   ```

   The Y means to link this driver into the kernel when rebuilding a new kernel. Use N if the driver is not used to reduce the size of the kernel for better performance.

Now, go to the */etc/conf/cf.d* directory and invoke *./link_unix* to rebuild a new kernel. After a new kernel is built, reboot the system.

Removing the ASW-1450 from SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0

The ASW-1450 is not designed to be removed from SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0. If you attempt to remove the software, you can cause severe damage to the operating system. You might have to reinstall the operating system to restore the system to its previous state. You can, however, reinstall the ASW-1450 over an existing ASW-1450 installation.

11 Changing the Host Adapter Type

About This Chapter

Read this chapter to find out:

- How to use the *change_ha* utility with SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0 to change the SCSI host adapter type
- How to change the SCSI host adapter type on a system with SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0

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There are two situations in which you might need to change the host adapter type for SCSI devices:

- If you have installed an AHA-1740 family host adapter and you want to change from Standard Mode to Enhanced Mode
- If you have replaced a host adapter in your system with another host adapter that uses a different prefix.

You use one method to change the host adapter type if you have installed SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0 and a different method if you have installed SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0.

Using the change_ha Utility

The *change_ha* program allows you to change the host adapter type for SCSI devices under SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0.

You are placed automatically in the *change_ha* utility during the installation of ASW-1450. You can also follow these instructions to execute *change_ha* from the operating system prompt.

1. Log into the system as root.
2. Change to the */etc/conf/cf.d* directory and enter the following command at the operating system prompt:

   ```
   ./change_ha
   ```

A screen similar to the following appears:

The SCSI configuration file has entries for the following devices:

Host Adapter Type	Devices	Adapter Number	ID	LUN
ad	disk	0	0	0
ad	tap	0	2	0

Do you wish to change the Host Adapter Type for any of these entries? (y / n)

Figure 11-1. change_ha Utility Screen

The information displayed on your screen may vary, depending on your current host adapter configuration. You are prompted to choose whether you want to change the host adapter type for any of the entries now for the devices listed in this display.

3 Enter y to change the host adapter type. A screen similar to the following appears:

For each entry, indicate whether you wish to change the Host Adapter Type the device is attached to.

Host Adapter Type	Devices	Adapter Number	ID	LUN
ad	disk	0	0	0

Change the Host Adapter Type? (y / n)

Figure 11-2. Current Host Adapter Configuration

This screen shows you the current host adapter configuration for one of your devices, and asks if you want to change it. The information displayed on your screen may vary.

4 Enter **y** to change the host adapter type for this entry or **n** to move to the next entry. If you enter **y**, this message appears:

```
Enter the new Host Adapter prefix, 'h' for help or 'q' to
quit:
```

5 To install an AHA-1740 family host adapter in Enhanced Mode, enter **eiad** (the host adapter prefix for the Enhanced Mode driver) at the prompt. Otherwise, enter the prefix for the new host adapter to which you are connecting the device. Refer to the table on page 9-4 for a list of prefixes.

The *change_ha* utility now displays configuration information for your next SCSI device and again asks whether you want to change it now. Answer the prompts as described previously for each device. When you have answered the prompts for all of your SCSI devices, *change_ha* displays the new SCSI configuration file entries. These entries now reflect all the changes that you made, if any. The following prompt appears:

```
Do you wish to change the Host Adapter Type for any of
these entries? (y/n)
```

6 If you have finished changing the entries, enter **n** to leave *change_ha*.

7 You must relink the kernel after you use *change_ha*. To do this, change to the */etc/conf/cf.d* directory and enter **./link_unix**. Remember that any host adapter type changes that you make with *change_ha* must be supported by corresponding changes to the hardware configuration using the vendor-provided EISA configuration utility, and vice versa.

If you change the prefix to *ad* to use an AHA-1540/1640 family host adapter or an AHA-1740 family host adapter in Standard Mode, you must also ensure that the interrupt vector value (IRQ), port address and DMA channel selection for the host adapter match the settings displayed by the EISA configuration utility.

Changing the Host Adapter Mode

Note: The information in this section does not apply to SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0. An AHA-1740 host adapter can be in either Standard or Enhanced Mode when you install these more recent versions of SCO UNIX and Open Desktop on your system.

The AHA-1740 family host adapter must be in Standard Mode when you install SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0.

If you attach the root hard disk to the *eiad* driver (AHA-1740 family driver in Enhanced Mode) during the installation of the ASW-1450, you must shut down your machine and change the AHA-1740 family to Enhanced Mode before rebooting your computer. You cannot access any devices that you configure as attached to the *eiad* host adapter until you reconfigure the adapter to Enhanced Mode. To do this:

1. Use your EISA configuration utility program to change the AHA-1740 family host adapter to Enhanced Mode. Follow the instructions in the EISA system documentation or the vendor-provided EISA configuration utility documentation.
2. Reboot your system.

Changing the Host Adapter Mode in SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0

Before changing your system configuration, you should make backup copies of:

- /unix (current kernel)
- ./etc/conf/cf.d/mdevice file
- ./etc/conf/sdevice.d directory
- ./etc/conf/pack.d directory

If an error occurs, you can restore these old files and directories.

If you need to configure an additional device into the kernel or if you need to modify an existing driver's parameters (e.g., interrupt vector level, DMA or port address), you must modify the files in the *./etc/conf/sdevice.d* directory. For example:

1. To change from an AHA-1540 host adapter to an AHA-1740 host adapter in Enhanced Mode, make modifications in these files. (These files are located in *./etc/conf/sdevice.d*):
   - in the *ad* file, change Y to N in the second field.
   - in the *eiad* file, change N to Y in the second field.
2. Go to the *./etc/conf/cf.d* directory and view the *mscsi* file. Be sure that the entry for the boot device has the correct **ha** prefix. The entry should look like this:

ha	attach	number	ID	LUN
auto	Sdsk	0	0	0

   The **ha** field (host adapter prefix field) can be either auto or the driver prefix–for example, the AHA-1740 Enhanced Mode would be eiad.
3. Invoke *./link_unix* at the UNIX prompt to build the new UNIX kernel.
4. Reboot the system so the new kernel will take effect.

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12 Using Multiple Host Adapters

About This Chapter

Read this chapter to find out:

- How to use two or more host adapters in your system
- How to reference a second host adapter
- The information needed by the *mkdev* utility when you add or remove a SCSI device

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Number of Host Adapters Allowed

The table below shows the number of each family of host adapters that you can install in your system for the ASW-1450 and for the Adaptec drivers embedded in the more recent versions of SCO UNIX and Open Desktop.

	Embedded Adaptec drivers (for SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0)	ASW-1450 (for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0)
ad AHA-1540 family AHA-1740 family (Standard Mode) AHA-1640	4 host adapters	2 host adapters using same prefix, or one using each prefix
eiad AHA-1740 family (Enhanced Mode)	No limit, other than number of available slots	
spad AHA-1520 family AIC-6260	1 host adapter	1 host adapter (drivers available separately in the ASW-1250)

Be sure to keep these limitations in mind as you read the information in this chapter.

Host Adapter Numbering

You must be careful to use the correct numbers when you specify multiple host adapters.

If you install two host adapters of the same type (i.e., host adapters that use the same prefix), the adapter at the lower-numbered slot and/or lower-numbered BIOS address is adapter0 and the adapter at the higher-numbered slot and/or higher-numbered BIOS address is adapter1. For example:

```
ad adapter0
ad adapter1
```

If you install two host adapters of different types (i.e., host adapters that use different prefixes) both host adapters are adapter0, and the prefix differentiates the different types of adapters. For example:

```
ad adapter0
spad adapter0
```

Defining the Primary Host Adapter

If you have a SCSI root disk, the host adapter attached to the root disk is the primary host adapter. To avoid confusion if you are using two host adapters, place the primary host adapter in the lower-numbered chassis slot. Use a lower-numbered BIOS address as well. Refer to your hardware documentation for detailed instructions.

Adding a Secondary Host Adapter

Follow these steps to add a secondary host adapter:

1. Place the secondary board in any available slot that is higher than the slot containing the primary host adapter.
2. Run the vendor-provided EISA configuration utility to configure the secondary host adapter. You must do the following:

   ```
   Assign a BIOS address for the secondary adapter
   that is higher than the BIOS address for the primary adapter.
   ```

   If the secondary adapter is an AHA-1540 family host adapter, refer to your hardware documentation for detailed instructions about reconfiguring the host adapter.
3. Reboot your machine.

Refer to your hardware documentation for detailed instructions. The next time that you access a device that is attached to the secondary board with a *mkdev* (see *SCO UNIX Addendum*) script (such as mkdev tape), the system notes the existence of the secondary host adapter. The *mkdev* script then prompts you for configuration information as described in the next section, *Referencing a Second Host Adapter.*

Referencing a Second Host Adapter

The *mkdev* script prompts you for information when you add a second AHA-1540 family host adapter or AHA-1740 family host adapter (Standard Mode) of the same type as the first. Be prepared to supply the following information the first time that you reference the second adapter:

- Interrupt vector (only required for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0)
- Start I/O hexadecimal address
- Stop I/O hexadecimal address

The preferred start I/O address for an AHA-1540 family host adapter or an AHA-1740 family host adapter (Standard Mode) is 330h for the primary adapter, and 230h for a secondary adapter. The stop I/O address should always be the start I/O address plus 2 (332h for primary adapters and 232h for secondary adapters). For more information, refer to the AHA-1540 family host adapter or AHA-1740 family host adapter hardware documentation.

The *eiad* driver dynamically provides the required information to the kernel from the EISA CMOS storage area.

Adding or Removing a SCSI Device

When you add or remove a SCSI device, you must execute a **mkdev** (see *SCO UNIX Addendum*) configuration command for that device. For example, execute **mkdev tape** if you are adding a tape drive. Be prepared to supply the *mkdev* utility with the following information:

- Host adapter prefix
- Host adapter number
- Target ID of the host adapter
- Logical Unit Number (LUN) of the device

The host adapter prefix identifies the host adapter to which you are attaching a device. The following table lists the host adapter prefixes:

Prefix	Host Adapter	Availability
ad	AHA-1540 family AHA-1640 AHA-1740 family (Standard Mode)	Embedded in both earlier and current versions of SCO UNIX and SCO Open Desktop
eiad	AHA-1740 family (Enhanced Mode)	Available in ASW-1540 for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0. Embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0
spad	AHA-1520 family AIC-6260	Available in ASW-1250 for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0. Embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0

Refer to the ***mkdev*** page in the *SCO UNIX Addendum* for more information. You must reconfigure the kernel whenever you add or remove a SCSI device. This updates the SCSI configuration file with the location of the new device. You must relink the kernel and reboot the system to access the new device.

For more information about configuring SCSI devices, refer to the ***mkdev*** manual page in the *SCO UNIX System V/386 System Administrator's Reference* or to the *Open Desktop Administrator's Manual.*

Using the mkdev hd Utility

ASW-1450 provides a new parameter, *eiad*, to the *mkdev hd* utility. If you are in Enhanced Mode, use the *eiad* parameter when adding more hard disks to your AHA-1740 family. The syntax of *mkdev hd* now is:

```
mkdev hd ID# HA# LUN# prefix
```

Replaced the italicized placeholders with the appropriate SCSI ID, host adapter number, LUN and prefix.

> **Note:** When adding a secondary hard disk, you must invoke *mkdev hd* twice. Complete both steps, rebooting between the two passes of *mkdev hd*, before attempting to add another hard disk. Refer to *mkdev* (see *SCO UNIX Manual*) for more information about *mkdev hd*.

SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0 also support the new *mkdev hd* parameter eiad.

13 Operating Notes

About This Chapter

Read this chapter to find out:

- Miscellaneous information on how to use the ASW-1450 SCO UNIX manager and the embedded Adaptec drivers in the latest releases of SCO UNIX and SCO Open Desktop

▼▼▼▼ 13

Operating System Defaults

We recommend that you use the following default settings when installing or adding an AHA-1540 family host adapter to SCO UNIX or Open Desktop. AHA-1740 family host adapters use the same settings in Standard Mode:

Host Adapter Number	Interrupt Vector	DMA	I/O Port
ad 0	11	5	330h
ad 1	12	6	230h

SCSI Device Limitations

ASW-1450 supports a maximum of two SCSI boards. It supports a maximum of four SCSI hard disks and four SCSI tape drives, using one or two SCSI boards.

See *Features* on page 9-7 to find out how many SCSI boards are supported by the Adaptec drivers embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0. These versions of the SCO products support a maximum of 64 hard disk drives, 4 tape drives and 4 CD-ROM drives.

Reinstalling the Link Kit

If you need to reinstall the Link Kit after installing the ASW-1450, you must reinstall the supplement before reconfiguring the kernel.

Using a Network Card

You may experience problems using a network card in an EISA system. If you notice long delays when attempting to access a SCSI device, please see *Long Delays Accessing a SCSI Device* on page 13-9. You may also experience system hangs during network access. This occurs because a fast EISA machine may experience timing problems with the older 8-bit network cards like the 3Com501. If serious problems persist, try using a newer network card.

Using the adfmt Command

The adfmt command (see *SCO UNIX Addendum*), which formats SCSI hard disks, does not work properly in SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0. However, most SCSI hard disks use an embedded controller and therefore do not need to use this command.

The adfmt command is not supported by the the Adaptec software embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0.

Rewinding a SCSI Tape after Write Operations

If your tape drive does not automatically rewind the tape after write operations, you must verify that you are using the correct device file. Each SCSI tape device has multiple special device filenames associated with it. The tape device reacts differently depending on which special device filename you are using.

A special device filename has the form *prefix*Stp*n* where *prefix* indicates the type of the device and *n* indicates the device number (0-6) of the device that you are accessing. The *prefix* supports the following options for SCO UNIX System V/386 Release 3.2 v2.0 and SCO Open Desktop Release 1.1.0:

nr	no-rewind device
r	raw device
x	control device

The following prefix option was added for SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0:

nu	no-unload device

To determine the number of the device that you are using, view the file */etc/conf/cf.d/mscsi* and note the order of tape device entries in this file. Devices are listed in this file according to the order in which they were installed, and the order determines the device number. For example, the first tape device is device number 0, the second device is device number 1, the third device is device number 2, and so on. If you want to know the SCSI ID of the device, you can read it in the ID column of the *mscsi* file.

Using the device number for *n* in the following command, enter:

```
ls -l /dev/*Stpn
```

This command lists all the special device files for the unit that you are using, as well as the major and minor numbers. A sample listing follows:

```
crw-rw-rw-  1 root  root  46,8     Aug 27 1992  /dev/nrStp0
crw-rw-rw-  1 root  root  46,0     Aug 27 1992  /dev/rStp0
crw-rw-rw-  1 root  root  46,128   Aug 27 1992  /dev/xStp0
```

The two numbers displayed before the date fields are the major and minor numbers, respectively. The minor number determines the type of device, 8 for no-rewind and 0 for raw. The device name nrStp0 is a mnemonic for a no-rewind device, and the device name rStp0 is a mnemonic for a raw device:

Minor Number	Device Name	Action
0	rStp*n*	rewind, unload on close (Default)
4	nuStp*n*	no unload on close
8	nrStp*n*	no rewind on close
16		High density (6250 BPI)
32		ECC
64		Partition (HP DAT)
128		Control/override device

If the device filename that you use has the minor number 0, the tape is rewound automatically after the command completes. The following sample command rewinds the tape after the tar(C) command is finished:

```
tar cvf /dev/rStp0 <filenames>
```

<filenames> represents the names of the files you want to back up. On some versions of SCO UNIX System V/386 Release 3.2 v2.0, the device names are reversed. A device named */dev/rStpn* does not rewind the tape if it has a minor number of 8. In this case, use the device name */dev/nrStpn* to rewind the tape.

Read and Write on a No-Rewind Tape Device

Many SCSI cartridge tape drives do not support intermixing read and write operations on a no-rewind tape device. The QIC-02 standard requires this restriction on appending data. SCSI cartridge tape drives made by Wangtek, Archive, and Tecmar are known to have this restriction; however, some tape drives with different firmware from these manufacturers may not have this restriction. Certain versions of the Cipher SCSI cartridge tape drive and some nine-track SCSI tape drives are known to not have this restriction.

On a no-rewind SCSI tape device with this restriction, there are three states of the SCSI tape drive:

- Read state when the tape is being read
- Write state when the tape is being written
- General state

The tape cannot be read when in the Write state, and it cannot be written when in the Read state. The only way to go from the Read state to the Write state is by passing through the General state.

There are only four ways to enter the General state:

- Completion of diagnostics (you power-cycle the tape drive for a *hard* reset)
- Completion of rewind, erase, or load commands (you rewind the tape to the beginning)
- Attempting to read past the last block of the tape (you create an End-Of-Tape (EOT) condition)
- Occurrence of an error reading the tape when in Read or Write state

The occurrence of a read error is the easiest way to pass between the Read and Write states. By creating a read error to enter the General state, you can work around the restriction on writing data to your tape directly after you have read data from your tape. Examples for successfully appending data after a read operation are provided later in this chapter. The next few paragraphs describe how the restriction on appending data manifests itself.

Imagine that you have a tape loaded in an Archive SCSI tape drive. You choose to write a number of files on your tape drive using the

tar(C) and tape(C) commands on a no-rewind tape device, */dev/nrStp0*.

Enter the following series of commands:

```
tape -s rewind /dev/nrStp0
tar cbf 20 /dev/nrStp0 first batch of files
tar cbf 20 /dev/nrStp0 second batch of files
tape -s rewind /dev/nrStp0
tar tvf /dev/nrStp0
tar tvf /dev/nrStp0
```

After checking the integrity of the first two batches of files with *tar tvf /dev/nrStp0* as shown in the previous example, you now decide to write out the third batch of files after the first two batches of files. However, perhaps you forget that you need to pass through the General state in order to go from the Read to Write state. You execute the following command:

```
tar cbf 20 /dev/nrStp0 third batch of files
```

If you have the ASW-1450 installed, the SCSI tape driver reports the following error:

```
Warning: Stp : Possible SCSI Error:
Warning: Illegal Request:
```

To successfully append the third batch of files, you must issue a tar t or tape rfm command to cause a read error. The read error allows you to enter the General state before entering the Write state.

If you see the previous error message, you can execute the following tar commands on the no-rewind device as follows:

```
tar tvf /dev/nrStp0 (creates an read error, but no error message)
tar cbf 20 /dev/nrStp0 third batch of files
```

The third batch of files is successfully appended to the tape.

Although this restriction has always existed for certain SCSI tape drives, the default SCSI tape driver for the operating system (without ASW-1450 installed) does not report the error when you attempt to go directly between Read and Write states. This does not indicate that intermixing read and write operations in such a manner works without the ASW-1450 installed; the error still occurs, but it is not reported.

Use this example to execute the task described in the previous example without viewing the first two batches of files:

```
tape -s rewind /dev/nrStp0
tar cbf 20 /dev/nrStp0 first batch of files
tar cbf 20 /dev/nrStp0 second batch of files
tape -s rewind/dev/nrStp0
```

You can append additional files to the tape as shown:

```
tape -s rfm /dev/nrStp0
tape -s rfm /dev/nrStp0
tape -s rfm /dev/nrStp0 (creates a read error, but no error message)
tar cbf 20 /dev/nrStp0 third batch of files
```

Warning Messages During Heavy Disk Access

When you have heavy disk access on multiple partitions on one or more hard disks, you may see warning messages such as: **Region table overflow** and **File table overflow**. If you encounter these or similar messages, you must modify certain kernel parameters. Refer to *Tuning System Performance* in the *SCO UNIX System V/386 System Administrator's Manual*, or *Adjusting System Parameters* in the Tips and Tricks chapter of *Tips, Tricks, and Troubleshooting* in the *Open Desktop User's Manual*.

Errors on SCSI Hard Disk Drives

The hard disk driver may report the following error message, which can be safely ignored:

```
WARNING:Sdsk unit 2: unrecoverable error: key 0 0 0,
data block 0
```

Note: If the previous warning message appears with non-zero values for the key fields, it indicates an error on the hard disk at the given block number. If you know the name of the file containing the bad block, you can create a directory in the root directory called */badtracks* and move the offending file to that directory. Use the **mv(C)** command to move the file. This prevents any further access to the bad block.

Long Delays Accessing a SCSI Device

If you experience long delays (greater than four seconds) before accessing a SCSI device, the problem is probably caused by an interrupt vector conflict. Interrupt vector conflicts are often reported at boot time. If you see a conflict at boot time, change the interrupt vector of one of the conflicting boards. To do this, refer to your hardware documentation.

> **Note:** You must execute the vendor-provided EISA configuration utility to reflect any changes to hardware interrupt vectors.

Under certain circumstances, interrupt vector conflicts are not reported at boot time. For instance, because of the way in which information is stored for the AHA-1740 family Enhanced Mode driver, conflicts with the AHA-1740 family are not detected at boot time. You can verify a suspected interrupt vector conflict by using the vendor-provided configuration utility to check the IRQ for the AHA-1740 family board. Compare this number with IRQ values for other hardware to detect any conflicts.

Also, some 8-bit networking cards have a default interrupt vector setting of IRQ 2, which is automatically reset to IRQ 9. The vendor-provided EISA configuration utility does not reflect this automatic change. If you are using one of these 8-bit networking cards and you experience long access delays to a SCSI device, make sure that no other hardware has an interrupt vector of IRQ 9. If another piece of hardware is using an interrupt vector of IRQ 9, reconfigure the network card to use another interrupt vector.

Standard Mode Device Access

If you cannot access any device attached to a host adapter in Standard Mode, you might have a problem with conflicting interrupt vectors and start I/O and stop I/O hexadecimal addresses. Compare the entries for these values in the */etc/conf/sdevice.d/ad* file with the values displayed by the vendor-provided EISA configuration utility to see if the interrupt vector and the start I/O and stop I/O hexadecimal addresses match.

The */etc/conf/sdevice.d/ad* file consists of one or two lines, depending on the number of AHA-1540 family host adapters or AHA-1740 family host adapters in Standard Mode on your system.

Here is a sample *ad* file for a system running SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0:

```
ad Y 1 5 1 11 330 332 0
```

The sixth field from the left displays the interrupt vector, which is 11 in this example. The seventh and eighth fields display the start I/O and stop I/O hexadecimal addresses, respectively.

In this sample entry, the start I/O hexadecimal address is 330, and the stop I/O hexadecimal address is 332.

Here is a sample *ad* file for a system running SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0:

```
ad Y 1 5 0 0 330 332 0 0
```

The interrupt vector is not listed because the *ad* driver automatically reads it through the hardware jumpers. The seventh and eighth fields display the start I/O and stop I/O hexadecimal addresses, respectively, as in the preceding example.

The last (or only) entry in */etc/conf/sdevice.d/ad* is the entry for the secondary host adapter if it is an AHA-1740 family host adapter in Standard Mode or if it is an AHA-1540 family host adapter. The values in the interrupt vector and start and stop I/O hexadecimal address fields must match the values as displayed by the vendor-provided EISA configuration utility. If they do not match, use the vendor-provided EISA configuration utility and change the values to match those in */etc/conf/sdevice.d/ad*. If these new values conflict with the values for the primary host adapter, ASW-1450 displays a warning. You must then change the values for the primary host adapter as well.

System Performance

The ASW-1450 and the Adaptec software embedded in SCO UNIX and Open Desktop will implement high-performance support for a broad range of SCSI peripherals without further intervention. However, where the highest performance is required, some alterations to parameters may result in improved performance, depending on the system environment and applications used.

Tag Queuing

Tag queuing is a SCSI-2 option implemented by several large SCSI hard disk drives. It allows a series of commands, sent to the drive by the host adapter, to be executed in an optimal order and not necessarily in the order in which they were sent.

Normally, tag queuing is *disabled* by default in ASW-1450. This is because during system testing, some drives were found to have non SCSI-conforming tag queuing implementations. Tag queuing is *enabled* by default in the Adaptec drivers embedded in the more recent version of SCO UNIX and Open Desktop.

Enabling Tag Queuing in ASW-1450

Follow these steps to enable tag queuing in the ASW-1450 for SCO UNIX System V/386 Release 3.2 v2.0 or SCO Open Desktop Release 1.1.0:

1. Change directories to the */etc/conf/pack.d/Sdsk* directory by entering:

   ```
   cd etc/conf/pack.d/Sdsk
   ```

2. Edit the file *space.c.* in this directory, using the *vi* editor by entering:

   ```
   vi space.c
   ```

3. Search for the string Sdsk_no_tag = 0 (which means disable tag queuing) and replace it with Sdsk_no_tag = 1 (which means enable tag queuing) by entering:

   ```
   :g/tag = 0/s//tag = 1
   ```

4. Save the file by entering:

   ```
   :wq
   ```

5 Relink the kernel to enable the new capability by entering:

```
cd etc/conf/cf.d
./link_unix
```

6 Reboot the system to invoke the newly linked kernel.

Disabling Tag Queuing for SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0

To disable tag queuing for SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0, follow exactly the same steps listed in the previous section.

The difference is that in this version of SCO UNIX and Open Desktop, the meaning of the text strings listed in step 3 is reversed: Sdsk_no_tag = 0 means enable tag queuing and Sdsk_no_tag =1 means disable tag queuing.

Tuning Performance for Single Disks

UNIX frequently operates with multiple disks in the system. In this configuration, the power of the multitasking/multithreading capabilities of Adaptec bus master host adapters can be used to the full. The ASW-1450 and the Adaptec drivers embedded in SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0 are configured by default for multiple disks.

If your system has a single disk, however, you can optimize performance by following these instructions.

ASW-1450

1 Change directories to the */etc/conf/pack.d/Sdsk* directory by entering:

```
cd etc/conf/pack.d/Sdsk
```

2 Edit the file *space.c.* in this directory, using the *vi* editor by entering:

```
vi space.c
```

3 Search for the string NUM_OUT = 4 and replace it with NUM_OUT = 15 by entering:

```
:g num_out 4/s//num_out 15
```

4 Save the file by entering:

```
:wq
```

5 Relink the kernel to enable the new capability by entering:

```
cd etc/conf/cf.d
./link_unix
```

6 Reboot the system to invoke the newly linked kernel.

SCO UNIX System V/386 Release 3.2 v4.0 or SCO Open Desktop Release 2.0

1 Execute the following command:

```
etc/conf/bin/idtune SDSKOUT 15
```

2 Relink the kernel to enable the new capability by entering:

```
cd etc/conf/cf.d
./link_unix
```

3 Reboot the system to invoke the newly linked kernel.

Manual Excerpt for change_ha (ADM) for ASW-1450

Note: This information applies only to ASW-1450. The *change_ha* utility is not supported in the later versions of SCO UNIX and Open Desktop.

Name:

change_ha - changes host adapter

Syntax:

/etc/conf/cf.d/change_ha

Description:

You must log in as *root* to execute the script. The *change_ha* script has no options.

The *change_ha* script displays a table that shows the SCSI host adapters to which particular SCSI devices are attached. It also asks if you want to change the host adapter prefix to identify a different host adapter with a device. If you change the host adapter prefix,

change_ha writes this new information to the *mscsi* file that the system uses for configuration information. Normally, this script is executed as part of the ASW-1450 installation procedure. You can invoke the *change_ha* script separately if you need to modify the configuration after completing the installation. You must relink the kernel after executing *change_ha* to effect your changes.

If you configure two host adapters of the same type and then remove the adapter that has a SCSI ID of 0, *change_ha* automatically renumbers the second adapter's ID from 1 to 0 and updates the appropriate files in the */etc/conf/sdevice.d* directory.

This release supports two host adapters, identified by prefix in the following table:

Prefix	Adapter Board
ad	ISA SCSI Host Adapter or EISA SCSI Host Adapter (Standard Mode)
eiad	EISA SCSI Host Adapter (Enhanced Mode)

The *mscsi* file also identifies the type of device, the number of the host adapter (0 or 1), the SCSI ID, and the Logical Unit Number (LUN). To configure a device that is not yet configured on the system or to change the fields other than the prefix, use the mkdev tape or mkdev hd commands.

The *change_ha* script prompts you for information when you add a second ISA SCSI host adapter or EISA SCSI host adapter (Standard Mode) of the same type as the first. Be prepared to supply the following information the first time that you reference the second adapter:

- Interrupt vector
- Start I/O address
- Stop I/O address

The preferred start I/O address for either ISA SCSI host adapter or EISA SCSI host adapter (Standard Mode) is 330h for the primary adapter and 230h for a secondary adapter. The stop I/O address should always be the start I/O address plus two (332h for the primary adapter and 232h for the secondary adapter).

Files:

/etc/conf/cf.d/mscsi
/etc/conf/sdevice.d/ad
/etc/conf/sdevice.d/eiad

> **Note:** Changes made with the *change_ha* script take effect after you relink the kernel, such as when the system is rebooted during installation. To relink the kernel from the operating system command line, change to the */etc/conf/cf.d* directory and enter ./link_unix.

The *change_ha* script checks the *mscsi* file to ensure that the number of adapters referenced is not greater than two. If the *mscsi* file is wrong, *change_ha* prints the error message you will need to edit */etc/conf/cf.d/mscsi* before you can continue, and then exits.

See also:

link_unix (ADM)
mkdev (ADM)
change_ha (ADM)

Manual Excerpt for eisa (ADM)

> **Note:** This information applies to ASW-1450 and to SCO UNIX System V/386 Release 3.2 v4.0 and SCO Open Desktop Release 2.0.

Name:

eisa - reports on boards installed on the EISA bus

Syntax:

/etc/eisa[slots|h|H]

Description:

You must log in as *root* to execute the script.

The eisa command provides information about the host adapters installed on the system. By default, eisa reports on the motherboard and 15 slots (0-15). You can specify a number of slots for which you want a report. If you specify a higher number of slots than you have on your computer, the eisa report for those slots is invalid. If you do not specify slot information, use H or h to get usage information.

The following table represents a sample report:

Slot	EISA ID	Vendor	Prod #	Rev #	EISA Ver
MB	22 F0 FD 09	HWP	0xFD	01	1
4	04 90 00 00	ADP	0x000	00	
6	04 90 00 00	ADP	0x000	00	
15	22 F0 08 01	HWP	0x080	01	

These columns have the following meanings:

Slot – Logical number of the slot on the EISA bus to which the board is attached. The motherboard is always configured as slot 0, so slot 0 is reported as MB.

EISA ID – Standard EISA ID. The first four digits represent the vendor, and the next four digits represent the product number and the revision number for the product.

Vendor – Abbreviation for board vendor. The sample report shows that the motherboard and the board in slot 15 are sold by HP, and the boards in slots 4 and 6 are sold by Adaptec. This column interprets vendor information in the first four digits of the EISA ID column.

Prod# – Product number of the individual board. These numbers are assigned by the vendor and should be explained in the documentation that accompanies the board.

Rev# – Hardware revision number for the board.

EISA Ver – EISA version number. Each motherboard is encoded with a version of the EISA specification to which it conforms, and that version number is given in this column.

> **Note:** The eisa command reports only EISA boards that are installed on an EISA system, not the 8- or 16-bit ISA (XT/AT) boards.

Diagnostics eisa returns a 0 value if successful. A return value of 1 indicates a command line error, 2 that the motherboard was not located, and greater than 2 an unspecified error. If the slot number that you specify is larger than the actual number of slots, the results are unpredictable; however, the return value is still 0.

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